



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

**COMPETENCY BASED CURRICULUM**

# **SOIL TESTING AND CROP TECHNICIAN**

(Designed in 2017)

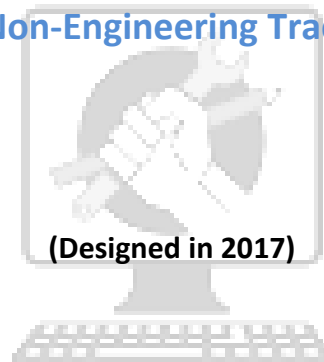
**CRAFTSMEN TRAINING SCHEME (CTS)  
NSQF LEVEL – 4 (PROPOSED)**



**SECTOR – AGRICULTURE, HORTICULTURE, FLORICULTURE**

# SOIL TESTING & CROP TECHNICIAN

(Non-Engineering Trade)



**CRAFTSMEN TRAINING SCHEME (CTS)**

**NSQF LEVEL – 4 (PROPOSED)**

**Skilled India**  
कौशल भारत - कुशल भारत

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

**CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE**

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Kolkata – 700 091

## ACKNOWLEDGEMENT

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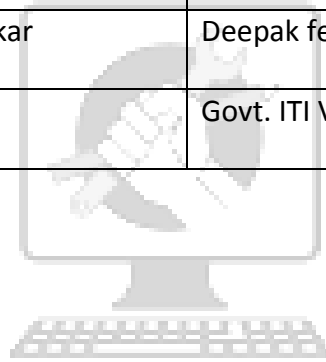
<b>Date of Trade Committee Meeting: 17.05.2017 at Deepak Fertilizers, Pune.</b>			
<b>Sl. No.</b>	<b>Name &amp; Designation Sh/Mr./Ms.</b>	<b>Organization</b>	<b>Remarks</b>
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Industrial Training Institute

## Soil Testing and Crop Technician

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## 1. COURSE INFORMATION

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During the one year duration of “Soil Testing and Crop Technician” trade a candidate is trained on professional skill, professional knowledge and Employability skill. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered related to the trade are categorized in two semester of six months duration each. The semester wise course coverage is categorized as below:-

**1<sup>st</sup> Semester** – This semester primarily deals with soil testing. The trainee learns about safety and environment, Elementary first aid and fire fighting. He gets the idea of trade tools, apparatus & their standardization, calibration, identifies different types of Laboratory equipments. Preparation of standard solution and chemical reagents for soil testing. The trainee will practice different soil testing methods to determine various properties viz. soil texture, pH value, moisture content, Electric conductivity, hydraulic conductivity, organic carbon, Cation exchange capacity etc. Training will be provided for the estimation of macro and micronutrients and also elements of environmental concern in soil samples. Trainee will also be able to examine the quality of irrigation water, generate soil test report and recommend fertilizer, dosage and their method of application based on soil properties. The trainee learns to use modern technology (GPS/GIS) for collection of data and input recommendations.

**2<sup>nd</sup> Semester** – This semester mainly deals with crop cultivation. The trainee practices on different tillage, ploughing and puddling implements. Measurement of various atmospheric elements viz, rainfall, barometric pressure, wind speed, sunshine duration, solar radiation and relative humidity etc. Practice different farm machinery viz. seed drill, tractor, power weeder, power tiller, threshers and paddy transplanter etc. Practice field preparation, calculate seed & fertilizer requirements, growing rabi and kharif crops, control measures for crop diseases and insects, different methods of irrigation and integrated pests management. Seed testing, processing and packaging will also be practiced by the trainee. The trainee also practices organic farming including use of vermin compost, drip irrigation etc. Practice on water harvesting techniques and use of modern techniques for soil and moisture conservation and preservation of water.



## **2. TRAINING SYSTEM**

### **2.1 GENERAL**

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

CTS courses are delivered nationwide through network of ITIs. The course 'Soil Testing and Crop Technician' is of one year (02 semester) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional skills and knowledge, while Core area Employability Skills imparts requisite core skill, knowledge and life skills. After passing out the training programme, the trainee is being awarded National Trade Certificate (NTC) by NCVT having worldwide recognition.

#### **Trainee needs to demonstrate broadly that they are able to:**

- Read and interpret technical parameters/ documents, 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 & employability skills while performing jobs.
- Check the parameters of the test result with standard parameter.
- Carry out the farming with optimal utilization of resources.
- Document the technical parameters related to the task undertaken.

### **2.2 CAREER PROGRESSION PATHWAYS**

- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).

### **2.3 COURSE STRUCTURE**

Table below depicts the distribution of training hours across various course elements during a period of one year (02 semesters): -



Sl. No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	1260
2	Professional Knowledge (Trade Theory)	252
3	Employability Skills	110
4	Library & Extracurricular activities	58
5	Project work	160
6	Revision & Examination	240
	<b>Total</b>	<b>2080</b>

## 2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

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

### 2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. For the purposes of determining the overall result, 25 percent weight is applied to the result of each semester examination.

### 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 assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.



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Assessment will be evidence based comprising 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

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
<b>(a) Weightage in the range of 60 -75% to be allotted during assessment</b>	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	<ul style="list-style-type: none"> <li>• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment</li> <li>• Below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job.</li> <li>• A fairly good level of neatness and consistency in the finish</li> <li>• Occasional support in completing the project/job.</li> </ul>
<b>(b) Weightage in the range of above 75% - 90% to be allotted during assessment</b>	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	<ul style="list-style-type: none"> <li>• Good skill levels in the use of hand tools, machine tools and workshop equipment</li> <li>• 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.</li> <li>• A good level of neatness and consistency in the finish</li> <li>• Little support in completing the project/job.</li> </ul>
<b>(c) Weightage in the range of above 90% to be allotted during assessment</b>	
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	<ul style="list-style-type: none"> <li>• High skill levels in the use of hand tools, machine tools and workshop equipment</li> <li>• Above 80% tolerance dimension achieved while undertaking different work with</li> </ul>



which demonstrates attainment of a high standard of craftsmanship.

those demanded by the component/job.

- A high level of neatness and consistency in the finish.
- Minimal or no support in completing the project.



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**Laboratory Assistant, Soil;** sets up apparatus and equipment, conducts routine soil tests in laboratory for determining soil characteristics to correct soil defects, raise fertility, etc. and assists Soil Scientist or Chemist as required. Collects samples of required type of soil. Gets them dried in oven and sieved to get soil of required size. Weighs fixed quantities of soil, sets apparatus and conducts routine tests to determine their physical and chemical properties, such as shear strength, permeability, composition, water content, percentage of nitrogen etc. Adds or eliminates chemicals and salts from soil as directed by Soil Technologist or Chemist to remove defects, raise fertility etc. to render better yield. Maintains record of reading and observations, for calculating and reference purposes. Prepares standard chemicals and solutions required for testing samples and maintains laboratory clean and tidy.

**Paddy Farmer;** cultivates paddy as per the package of practices recommended for a particular agronomic climate zone, type of soil, rainfall pattern and climatic conditions to achieve the yields as per the genetic potential of a given variety and sell the produce in the market.

**Cultivator, Crop;** Farmer, Crop grows field crops of wheat, paddy, cotton, sugar cane etc., according to type of land and irrigation facilities available. Determines type of crop to be grown according to nature of soil, climatic conditions, irrigation and marketing facilities in that area. Selects and purchases seeds, fertilises and other items of farm equipment including machinery. Clears land of grass, stones etc. using spades and other tools. Divides farm into easy portions (fields) and raises boundary round them for retention of water. Ploughs land or breaks it by means of tractor or other implements to soften earth and increase fertility. Connects land with source of water by digging channels for irrigation as required. Sows by broadcasting seeds in field and leveling up with wooden plough. Conducts weeding and hoeing to conserve moisture. Fences farm using barbed wire or thorny bushes to prevent destruction of crops by animals and trespassing. Sprays insecticides and evolves measures to protect crop from plant diseases, insects and pests. Nurses growing crops by careful watch and harvests matured crops using sickle or other harvesting implements or machines. Collects and preserves seeds. Collects harvested crop into bundles and removes to threshing floors. Dries harvested crop in sun. Threshes crop and winnows to separate grain from chaff. Bags and transports yield by carts for storage and sale in market. Hires labourers if required and supervises their work. Prepares manure by collecting and storing cow dung into ditch. Keeps equipment, building, fences etc. in good order. May operate tractor, winnowing, threshing and other machines, May breed animals.

**Cultivator, Vegetables;** Farmer, Vegetables grows variety of vegetables according to soil, season and demand. Determines vegetables to be grown taking into consideration nature of soil, irrigation facilities, climatic conditions, consumption and market values. Selects and purchases seed, fertilisers and other items of farm equipment including machines. Ploughs land adopting indigenous methods or breaks land by tractor. Divides land into small plots by raising small bunds (earthwork) around for retention of water and manure. Clears land by removing grass, stones, etc. by hand. Mixes manure with soil, sows seeds by spreading over



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ground and levelling or plant cutting and irrigates field as required, by digging out drains and connecting them to source of water. Fences farm if required with barbed wire or thorny bushes for protection. Spray insecticides and takes other protective measures against plant diseases and destruction by wild animals, pests etc. Hoes and weeds fields to conserve moisture. Harvests matured vegetables by cutting with knife or pulling or digging out from ground using hand tools. Transports vegetables to market place for sale. Hires labourers on cultivation if required and supervises their work. Keeps buildings, fences and other agricultural equipment in good repairs. Collects farmyard refuse to convert it into manure. May operate tractor for preparing fields. May arrange to keep vegetables in cold storage. May specialize in growing any particular kind of vegetable like peas, potatoes, etc.

### **Reference NCO-2015:**

- (i) 3111.0200 - Laboratory Assistant, Soil
- (ii) 6111.0101 - Paddy Farmer
- (iii) 6111.0200 - Cultivator, Crop
- (iv) 6111.1300 - Cultivator, Vegetables



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## 4. GENERAL INFORMATION

Name of the Trade	<b>SOIL TESTING AND CROP TECHNICIAN</b>			
<b>NCO - 2015</b>	3111.0200, 6111.0101, 6111.0200, 6111.1300			
<b>NSQF Level</b>	Level 4 (PROPOSED)			
<b>Duration of Craftsmen Training</b>	1 Year (2 Semesters)			
<b>Entry Qualification</b>	Passed 10 <sup>th</sup> class examination under 10+2 System of education with Science and Mathematics.			
<b>Unit Strength (No. Of Student)</b>	20 (Max. supernumeraries seats: 6)			
<b>Space Norms</b>	(i) 200 Sq. Metres (ii) 1 Acre Farming Land			
<b>Power Norms</b>	2 KW			
<b>Instructors Qualification for</b>				
(i) 'Soil Testing and Crop Technician' Trade	BSc. (Ag)/ B. Tech. (Ag) from recognised university with one year post qualification experience in relevant field. <b>OR</b> Diploma (Ag) from recognised board of education with two years post qualification experience in relevant field. <b>OR</b> NTC passed in Soil Testing and Crop Technician with Three years post qualification experience in relevant field.			
(ii) Employability Skill	MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes. <b>AND</b> Must have studied English/ Communication Skills and Basic Computer at 12 <sup>th</sup> / Diploma level and above. <b>OR</b> Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes.			
<b>Distribution of training on Hourly basis: (Indicative only)</b>				
<b>Total Hrs /week</b>	<b>Trade Practical</b>	<b>Trade Theory</b>	<b>Employability Skills</b>	<b>Extra-Curricular Activity</b>
40 Hours	30 Hours	6 Hours	2 Hours	2 Hours



**Note: - For units less than 4 (2+2), ITI can enter into MoU with Facilitator who will provide the Training to Trainees admitted and undergoing training in the Trade. The Facilitator should be University, Recognized Training Institute, Industry, Laboratory, Private farm owner/Nursery. The facilities of farm machineries and laboratory equipment should be made available to ITI trainees at the time of examination. This clause should be part of MoU to be signed. The training provider must be within the range of 15 Km or within city whichever is less.**



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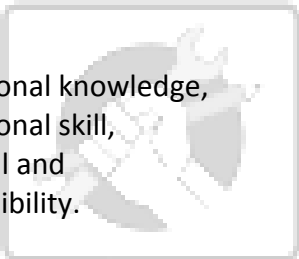
## 5. NSQF LEVEL COMPLIANCE

NSQF level for ‘Soil Testing and Crop Technician’ trade under CTS: **Level 4 (PROPOSED)**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

- 
- a. Process
  - b. professional knowledge,
  - c. professional skill,
  - d. Core skill and
  - e. Responsibility.

The Broad Learning outcome of ‘Soil Testing and Crop Technician’ trade under CTS mostly matches with the Level descriptor at Level- 4 (PROPOSED).

The NSQF level-4 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 4	work in familiar, predictable, routine, situation of clear choice	factual knowledge of field of knowledge or study	recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning.

## 6. LEARNING/ ASSESSABLE OUTCOME

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

### 6.1 GENERIC LEARNING OUTCOME

1. Apply safe working practices.
2. Comply environment regulations and housekeeping.
3. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
4. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
5. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
6. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

### 6.2 SPECIFIC LEARNING OUTCOME

#### **First Semester: -**

7. Collect sample from agricultural field and prepare sample for soil testing.
8. Perform soil testing to identify the different components in the soil.
9. Perform testing of irrigation water to determine various properties and chemical agents.
10. Calculate nutrients from different fertilizer sources, recommend appropriate fertilizer, quantum of dose and distribution of fertilizer based on the soil properties.
11. Use GPS/GIS in collection of data for input recommendation.

#### **Second Semester: -**

12. Measure environmental parameters for crop production.
13. Operate farming machines viz. Seed drill, tractor, power weeder, paddy transplanter and threshers etc.
14. Perform seed testing, processing and packaging.
15. Undertake crop cultivation, soil and irrigation water management.
16. Identify plant diseases and implement integrated pests management.
17. Undertake application of fertilizers for various crops.
18. Undertake organic farming, soil, vermin compost & pests management.
19. Undertake optimal use of water and recommend quantum & interval at which watering to be done in crop production and use of micro irrigation devices.
20. Prepare report on various aspects of farming.



## 7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
1. Apply safe working practices.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
2. Comply environment regulation and housekeeping.	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
	2.2 Deploy environmental protection legislation & regulations
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner
	2.4 Avoid waste and dispose waste as per procedure
	2.5 Recognize standard practices of operation and apply the same in the working environment.
3. Work in a team, understand and practice soft skills, technical English	3.1 Obtain sources of information and recognize information.
	3.2 Use documents and technical regulations and occupationally related provisions.



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to communicate with required clarity.	3.3	Conduct appropriate and target oriented discussions with higher authority and within the team.
	3.4	Present facts and circumstances, possible solutions & use English special terminology.
	3.5	Conduct written communication.
	3.6	Resolve disputes within the team
4. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	4.1	Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
	4.2	Their applications will also be assessed during execution of assessable outcome.
5. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	5.1	Semester examination to test knowledge on energy conservation, global warming and pollution.
	5.2	Their applications will also be assessed during execution of assessable outcome.
6. Explain entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	6.1	Semester examination to test knowledge on entrepreneurship.
	6.2	It's applications will also be assessed during execution of assessable outcome.



SPECIFIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
<b>SEMESTER-I</b>	
7. Collect sample from agricultural field and prepare sample for soil testing.	7.1 Make sampling plan to collect soil samples.
	7.2 Identify soil sampling equipment/ apparatus.
	7.3 Collect soil samples and prepare for testing.
	7.4 Demonstrate various chemical reagents required for soil testing.
8. Perform soil testing to identify the different components in the soil.	8.1 Identify apparatus / equipment for soil testing.
	8.2 Observe safety/ precaution during work
	8.3 Determine soil texture.
	8.4 Determine pH value of soil sample by electrometric and potentiometric method.
	8.5 Determine organic carbon in soil.
	8.6 Determine electrical conductivity of soils.
	8.7 Determine calcium carbonate in soil by rapid titration method.
	8.8 Determine N, P, K, Na, S, Ca, Mg in soil and demonstrate procedure.
	8.9 Determine cation exchange capacity of soil.
	8.10 Determine gypsum requirement of alkali soil.
	8.11 Determine lime requirement of deiclic soil.
	8.12 Prepare soil test report.
10.1 Prepare soil test summery and soil health card.	
9. Perform testing of irrigation water to determine various properties and chemical agents.	9.1 Identify apparatus / equipment for soil testing.
	9.2 Observe safety/ precaution during work.
	9.3 Determine pH value and electrical conductivity of water.
	9.4 Determine carbonates and bicarbonates in water.
	9.5 Determine Ca, Mg, N and chlorides in water.
	9.6 Determine rainfall erosivity and soil erodibility indices.
	9.7 Extract and determine micronutrients in water
10. Calculate nutrients from different fertilizer sources, recommend appropriate fertilizer, quantum of dose and distribution of fertilizer based on the soil	10.1 Determine total nitrogen and phosphorus in manures/ composts.
	10.2 Determine ammonical, nitrate nitrogen, water soluble P <sub>2</sub> O <sub>5</sub> , potassium, calcium and sulphur contents of fertilizers.
	10.3 Perform BOD (Biochemical oxygen demand) in organic wastes.
	10.4 Perform COD (Chemical oxygen demand) in organic wastes.
	10.5 Recommend fertilizer with the help of software.



properties.	10.6 As per soil texture recommend quantum of dose and distribution of fertilizer.
11. Use GPS/GIS in collection of data for input recommendation.	11.1 Demonstrate GPS / GIS equipment and set up for operation.
	11.2 Collect location information by GPS receivers for mapping field boundaries and irrigation systems.
	11.3 Navigate to specific locations in the field to collect soil sample data or monitor crop conditions.
	11.4 Locate problem areas in crops for input recommendations.
<b>SEMESTER II</b>	
12. Measure environmental parameters for crop production.	12.1 Measure rainfall, atmospheric pressure.
	12.2 Measure wind speed and wind direction etc.
	12.3 Measure relative humidity.
	12.4 Measure sunshine duration and solar radiation.
13. Operate and perform basic maintenance of farming machines viz. Seed drill, tractor, power weeder, paddy transplanter and threshers Etc.	13.1 Identify and demonstrate parts of seed drill and power weeder.
	13.2 Identify and demonstrate parts of power tiller and threshers.
	13.3 Demonstrate operation of seed drill.
	13.4 Demonstrate operation of power weeder.
	13.5 Demonstrate operation of power tiller.
	13.6 Demonstrate operation of power operated thresher.
	13.7 Demonstrate operation of paddy transplanter.
	13.8 Demonstrate field preparation.
14. Perform seed testing, processing and packaging.	14.1 Demonstrate various seeds and plants.
	14.2 Demonstrate procedure of seed testing.
	14.3 Demonstrate seed processing.
	14.4 Demonstrate packaging of seed.
15. Undertake crop cultivation, soil and irrigation water management.	15.1 Determine field capacity and water requirement for irrigation.
	15.2 Identify various rabi and kharif crop seeds.
	15.3 Demonstrate/ explain furrow method of irrigation.
	15.4 Demonstrate/ explain check basin and basin method of irrigation.
	15.5 Demonstrate operation of sprinkler irrigation system.
	15.6 Demonstrate various plant diseases.
	15.7 Demonstrate pests management for rabi and kharif crops.
	15.8 Demonstrate operation of paddy straw management machinery.
	15.9 Determine irrigation water use efficiency.
	15.10 Determine moisture content in grains.
	15.11 Demonstrate safe storage practices of grains.



16. Identify plant diseases and implement integrated pests management.	16.1 Identify crop pests with symptoms of damage in crops.
	16.2 Demonstrate cultural control technique for integrated pests management.
	16.3 Demonstrate mechanical control technique for integrated pests management.
	16.4 Demonstrate sanitary control technique for integrated pests management.
	16.5 Demonstrate natural control technique for integrated pests management.
	16.6 Identify different pesticides, herbicides, fungicides, weedicides etc.
17. Undertake application of fertilizers for various crops.	17.1 Identify various inorganic fertilizers.
	17.2 Demonstrate any two methods of application of fertilizer.
	17.3 Demonstrate application of fertilizers through irrigation water.
	17.4 Demonstrate method of preparation of compost from organic waste.
	17.5 Demonstrate safe methods of fertilizer storage and handling.
18. Undertake organic farming, soil, vermin compost & pests management.	18.1 Demonstrate use of vermin compost and residual waste in crops.
	18.2 Demonstrate use of organic fertilizer.
	18.3 Demonstrate use of bio-control agents and bio pesticides for pests management.
	18.4 Demonstrate drip irrigation method.
19. Undertake optimal use of water and recommend quantum & interval at which watering to be done in crop production and micro irrigation.	19.1 Demonstrate water harvesting techniques.
	19.2 Determine quantum of water for specific crop and soil.
	19.3 Determine interval of irrigation water for different types of crops.
	19.4 Demonstrate precision water harvesting and micro irrigation.
20. Prepare report on various aspects of farming.	20.1 Reports prepared on various topics will be assessed. <ul style="list-style-type: none"> <li>a) Setting a Net /poly houses.</li> <li>b) Establish soil testing laboratory.</li> <li>c) Setup a nursery.</li> <li>d) Setup agriculture product marketing.</li> <li>e) Waste management and produce organic manure.</li> </ul>



SYLLABUS FOR 'SOIL TESTING AND CROP TECHNICIAN' TRADE			
FIRST SEMESTER – 06 Months			
Week No.	Learning outcome	Professional Skills (Trade Practical) With indicative hours	Professional Knowledge (Trade Theory)
1	<ul style="list-style-type: none"> <li>Apply safe working practices.</li> <li>Comply environment regulation and housekeeping.</li> </ul>	<ol style="list-style-type: none"> <li>Identify safety symbols and hazards. (5 Hrs)</li> <li>Practice preventive measures to avoid accidents in laboratories. (5 Hrs)</li> <li>Identify factors for different chemicals accident (Eye accident, Burning reagents, Cloth burns, Skin burns, Poisons, Gas and Cuts etc.) (5 Hrs)</li> <li>Practice safe methods of fire fighting. (5 hrs)</li> <li>Practice elementary first aid. (5 hrs)</li> <li>Practice on cleanliness and procedure to maintain it. (5 hrs)</li> </ol>	<p>Importance of the trade. Physical and chemical properties of Soil and their influence on crop and water productivity.</p> <p>Fertility status of soils, soil deficiency with respect to macro and micro nutrient components, their sources &amp; Importance. Remedial measures to overcome deficiency.</p> <p>Material safety data sheet (MSDS) of chemicals and acids.</p>
2	<ul style="list-style-type: none"> <li>Collect sample from agricultural field and prepare sample for soil testing.</li> </ul>	<ol style="list-style-type: none"> <li>Identify various laboratory apparatus. (4 hrs)</li> <li>Demonstrate handling procedure for collection of soil samples. (4 hrs)</li> <li>Make sampling plan and collect representative soil samples. (4 hrs)</li> <li>Collect and prepare soil samples for fertility evaluation. (6 hrs)</li> <li>Record local land features like % slope and drainage characteristic. (4 hrs)</li> <li>Collect composite samples with following composite sampling procedure.</li> </ol>	<p>Soil texture, Soil bulk density, infiltration rate, soil aggregation, soil temperature and soil aeration.</p> <p>Requirements of Soil sampling for reclamation for garden plantation;</p> <p>Laboratory Layout, Built up area, Laboratory requirements, working pattern, budget requirement, trained manpower, various funding schemes and agencies.</p>



		(4 hrs) 13. Practice on processing / grinding of samples for analysis and sample storage. (4 hrs)	
3-4	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different components in the soil.</li> </ul>	14. Practice on handling of electrical balances, pipettes, burettes and solutions. (6 hrs) 15. Prepare standard solutions. (10 hrs) 16. Prepare various chemical reagents required for soil testing. (16 hrs) 17. Prepare buffer solution and determine molarity, normality and equivalent weight. (14 hrs) 18. Prepare standard solutions of hydrochloric acid of different concentrations. (14 hrs)	The soil organic matter and its importance in maintaining soil quality. Soil mineralogy and its significance.  Standardization of secondary standard Neutralization reactions
5-7	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different components in the soil.</li> </ul>	19. Determine soil texture by Feel Method. (6 hrs) 20. Determine soil texture by Ribbon formation. (6 hrs) 21. Determine soil texture by International Pipette Method. (8 hrs) 22. Determine soil texture by Buoyancy Hydrometer method. (8 hrs) 23. Determine saturation moisture percentage (water holding capacity). (8 hrs) 24. Determine bulk density by Weighing bottle method. (8 hrs) 25. Determine bulk density by Clod method. (8 hrs) 26. Determine bulk density by Core method. (8 hrs) 27. Determine hydraulic	Importance of Soil Texture. Soil properties affecting the determination of Texture. Soil biological properties and organisms in soil. Earthworms and their role in soil. Role of bacteria, fungi and actinomycetes in soil. Bio-fertilizers and their use in agriculture. Essential nutrients for crop growth. Role of macro and micronutrients in plant growth. Precautions in the use of pH meter. Importance of Soil Testing and Analysis. Brief study of instruments : pH Meter, Conductivity meter, spectrometer/ colorimeter,



		<p>conductivity of Soil by constant head method. (10 hrs)</p> <p>28. Determine hydraulic conductivity of soil by falling head method. (8 hrs)</p> <p>29. Determine soil moisture content by gravimetric method. (8 hrs)</p> <p>30. Determine soil moisture content by Infrared moisture meter method. (4 hrs)</p>	<p>UV-Spectrophotometer, atomic absorption spectrophotometer</p> <p>Use of soil testing kit and mobile soil testing van.</p> <p>Various methods for conducting soil tests.</p>
8	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different components in the soil.</li> </ul>	<p>31. Determine pH value of soil sample by Electrometric method. (10 hrs)</p> <p>32. Determine pH value of soil sample by Potentiometric method using glass electrode pH meter. (10 hrs)</p> <p>33. Determine electrical conductivity of soils. (10 hrs)</p>	<p>Effect of water content on soil pH, determination of soil pH.</p> <p>Principle of Potentiometric method, Glass electrode pH meter and maintenance of electrodes.</p> <p>Electrical conductivity of soils, Principle of Soil electrical conductivity meter, purpose, apparatus, determination of cell constant, temperature correction.</p> <p>Precautions in using electrical conductivity meter.</p>
9-11	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different components in the soil.</li> </ul>	<p>34. Determine organic carbon in soils by modified Walkely &amp; Black Method. (8 hrs)</p> <p>35. Determine organic carbon in soils by spectrophotometer method. (8 hrs)</p> <p>36. Determine organic carbon in soils by Dry combustion method. (8 hrs)</p> <p>37. Determine organic carbon in soils by Wet combustion method. (8 hrs)</p> <p>38. Determine rating of soil according to organic carbon value. (8 hrs)</p> <p>39. Determine calcium carbonate (free lime) in soil</p>	<p>Amelioration of nutrient deficiencies in different crops.</p> <p>Soil and foliar application of different nutrients with necessary precautions.</p> <p>Purpose to assess the fertility level of soil.</p> <p>Reagents, Dry combustion method, Wet combustion method, their principles.</p> <p>Oxidation and titration reactions, interpretation and rating of soil according to organic carbon value.</p> <p>Principle, calculations and interpretation for determination</p>





		<p>by acid neutralisation method. (8 hrs)</p> <p>40. Determine calcium carbonate in soil by schrotus apparatus method. (10 hrs)</p> <p>41. Determine calcium carbonate in soil by Hutchinson and Maclonnan Method. (8 hrs)</p> <p>42. Determine calcium carbonate in soil by Rapid Titration Method. (8 hrs)</p> <p>43. Determine calcium carbonate in soil by Modified Passion's Method. (8 hrs)</p> <p>44. Determine calcium carbonate in soil by Puri's Method. (8 hrs)</p>	<p>of calcium carbonate.</p>
12-13	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different components in the soil.</li> </ul>	<p>45. Determine Nitrogen by alkaline potassium permanganate method. (6 hrs)</p> <p>46. Determine Phosphorus in soils by Olsen's method. (7 hrs)</p> <p>47. Determine Potassium in soils by flame photometer. (8 hrs)</p> <p>48. Prepare standard curve of K<sub>2</sub>O using of flame photometer. (8 hrs)</p> <p>49. Determine Potassium in soils by neutral normal ammonium acetate method. (8 hrs)</p> <p>50. Determine Sodium on flame photometer. (6 hrs)</p> <p>51. Determine sulphur in soils. (6 hrs)</p> <p>52. Determine calcium and magnesium in soil. (10 hrs)</p>	<p>Determination of various nutrients in soil viz. nitrogen, phosphorus, potassium, sodium, sulphur, calcium and magnesium etc.</p> <p>Olsen's method, apparatus, Preparation of standard curve of P, Interpretation of results and P rating in soil.</p> <p>Principle of neutral normal ammonium acetate method. Preparation of standard curve of K<sub>2</sub>O and Na. Use of flame photometer. Precautions while using flame photometer. Use of turbidimeter/ colorimeter for determination of S in soil extracts. Principle of complex metric titration for determination of Ca and Mg in soil extracts.</p>
14	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different</li> </ul>	<p>53. Determine Cation exchange capacity by Ammonium saturation method. (6 hrs)</p>	<p>Use of gypsum and conjunctive use with canal waters. Cation exchange capacity.</p>



	components in the soil.	54. Determine Cation exchange capacity by Sodium Saturation Method. (6 hrs) 55. Perform extraction of calcium chloride. (6 hrs) 56. Determine gypsum requirement of alkaline soils. (6 hrs) 57. Determine lime requirement of acidic soil. (6 hrs)	Principle of calcium chloride extraction methods, reagents and apparatus required. Calculation and interpretation of the results.
15-16	• Perform testing of irrigation water to determine various properties and chemical agents.	58. Demonstrate handling procedure for collection of water samples. (6 hrs) 59. Determine pH value of irrigation water. (6 hrs) 60. Determine electrical conductivity of irrigation water. (6 hrs) 61. Determine carbonates and bicarbonates in irrigation water. (8 hrs) 62. Determine chlorides in irrigation water. (6 hrs) 63. Determine calcium and magnesium in irrigation water by EDTA Titrimetric Method. (10 hrs) 64. Determine Sodium on Flame Photometer. (6 hrs) 65. Determine Chloride in irrigation water. (6 hrs) 66. Determine sulphate in irrigation water by Colorimeter. (6 hrs)	Quality of irrigation water and their use in agriculture. Conservation agriculture and its role in saving natural resources, environment and sustaining crop productivity. Salt affected soils, water logged soils, alkaline and acidic soils. Reclamation of saline, alkaline and acidic soils.
17	• Perform testing of irrigation water to determine various properties and chemical agents.	67. Examine the quality of irrigation water – (22 hrs) i) Salinity ii) Alkalinity iii) Sodium adsorption ratio iv) Residual Sodium carbonates (RSC) v) Specific ion toxicity (Sodium, Chloride and	Problem of soil erosion in India. Water and wind erosion, Mechanism, Factors affecting rainfall erosivity and soil erodibility.



		<p>Boron) vi) Miscellaneous (BOD, Colour etc.)</p> <p>68. Determine rainfall erosivity and soil erodibility indices. (8 hrs)</p>	
18	<ul style="list-style-type: none"> <li>Perform soil testing to identify the different components in the soil.</li> <li>Perform testing of irrigation water to determine various properties and chemical agents.</li> </ul>	<p>69. Extract soil B by hot water soluble/calcium chloride solution method and necessary precautions. Determine B in soil extract/irrigation water using Azomethine-H method by spectrophotometer. (6 hrs)</p> <p>70. Extract soil Mo by ammonium oxalate (pH 3.3) solution and determine Mo using dithiol/thiocyanate method by spectrophotometer. (12 hrs)</p> <p>71. Extract soil micronutrient cations (Fe, Zn, Cu, and Mn ) by DTPA Method and determine them by Atomic Absorption Spectrophotometer. (6 hrs)</p> <p>72. Compare water and DTPA extractants for a range of peat and propagation media samples. (6 hrs)</p>	<p>Different agronomic and mechanical measures to control soil erosion by water and wind. Determination of B in soil samples.</p> <p>Atomic Absorption Spectroscopy, Principle of Atomic Absorption Spectrophotometer.</p> <p>Determination of available zinc, copper, iron, manganese and boron in soils.</p> <p>Working of hollow cathode lamp Principle of DTPA (di-ethylene tri-amine penta-acetic) Method.</p>
19-20	<ul style="list-style-type: none"> <li>Calculate nutrients from different fertilizer sources, recommend appropriate fertilizer, quantum of dose and distribution of fertilizer based on the soil properties.</li> </ul>	<p>73. Make Data entry in software for tested soil samples. (4 hrs)</p> <p>74. Determine total nitrogen, phosphorus and potassium in manures/ composts. (8 hrs)</p> <p>75. Examine ammonical, nitrate nitrogen, water soluble and 2% citric acid soluble - <math>P_2O_5</math>, water soluble - potassium,</p>	<p>Preparation of Soil analysis and test report, Fertilizer recommendation.</p> <p>Preparation of soil test summaries and fertility maps. Use of website for relevant information on soil types.</p> <p>Different types of fertilizers and their nutrient composition. Amount, time and methods of</p>



		<p>calcium and sulphur contents of fertilizers. (10 hrs)</p> <p>76. Perform BOD (Biochemical oxygen demand) and COD (Chemical oxygen demand) in waste water. (10 hrs)</p> <p>77. Generate soil test report and recommend fertilizer. (6 hrs)</p> <p>78. Practice on recommendation of quantum of dose and distribution of fertilizer based on soil properties. (10 hrs)</p> <p>79. Prepare soil test summaries and fertility maps. (6 hrs)</p> <p>80. Prepare soil health card. (6 hrs)</p>	fertilizer application.
21	<ul style="list-style-type: none"> <li>Use GPS/GIS in collection of data for input recommendation.</li> </ul>	<p>81. Practice use of GPS/GIS and their settings. (6 hrs)</p> <p>82. Collect location information by GPS receivers for mapping field boundaries, irrigation systems. (8 hrs)</p> <p>83. Navigate to specific locations in the field, to collect soil sample data or monitor crop conditions. (8 hrs)</p> <p>84. Accurately locate problem areas in crops for input recommendations. (8 hrs)</p>	<p>Integration of on-board computers, data collection sensors, and GPS</p> <p>Time and position reference systems.</p> <p>Precise application of pesticides, herbicides, and fertilizers.</p> <p>Optimal use of chemicals</p>
22-23	<p>Project work / Industrial visit</p> <p>Broad Areas:</p> <ol style="list-style-type: none"> <li>Visit to soil testing laboratory &amp; write a report.</li> <li>Visit to farmers fields for collection of soil samples and testing.</li> <li>Identification of nutrient deficiency symptoms in crops.</li> <li>Modern techniques for data collection.</li> </ol>		
24-25	Revision		
26	Examination		



<b>SYLLABUS FOR 'SOIL TESTING AND CROP TECHNICIAN' TRADE</b>			
<b>SECOND SEMESTER – 06 Month</b>			
<b>Week No.</b>	<b>Learning outcome Reference</b>	<b>Professional Skills (Trade Practical) With indicative hours</b>	<b>Professional Knowledge (Trade Theory)</b>
27	<ul style="list-style-type: none"> <li>Measure environmental parameters for crop production.</li> </ul>	85. Measure rainfall by Rain Gauge. (5 hrs) 86. Measure temperature and evaporation (atmospheric/soil). (5 hrs) 87. Measure Atmospheric Pressure by Barometer. (3 hrs) 88. Measure wind speed and direction by Anemometer and Wind vanes. (5 hrs) 89. Measure sunshine duration and solar radiation by Pyranometer. (8 hrs) 90. Measure Relative Humidity by Hygrometer. (4 hrs)	Agricultural meteorology: Weather and climate, micro-climate, weather elements, Earths' atmosphere, Composition and structure. Climate change: causes, effect on ecosystem, global warming, crop production and remedial measures. Wind: factors affecting, cyclones, anticyclones Formation and classification of clouds. Introduction to monsoon.
28	<ul style="list-style-type: none"> <li>Operate farming machines viz. Seed drill, tractor, power weeder, paddy transplanter and threshers etc.</li> </ul>	91. Identify trade tools and equipment. (4 hrs) 92. Practice on land measurement units and area calculation. (4 hrs) 93. Identify different systems/parts and operations of tractors. (4 hrs) 94. Practice tillage using hand tools. (6 hrs) 95. Practice of ploughing. (6 hrs) 96. Practice of puddling. (6 hrs)	Soil and its phases. Soil profile and its different horizons. Types of soils available in India. Tillage-principles, ploughing and puddling Classification of tractors, elementary knowledge about main components of tractor and their functions. Methods of starting and stopping of tractors.
29-30	<ul style="list-style-type: none"> <li>Operate farming machines viz. Seed drill, tractor, power weeder, paddy transplanter and threshers etc.</li> </ul>	86. Operate and perform adjustments in primary tillage implements (MB plough, Disc plough etc.). (6 hrs) 87. Operate and perform adjustments in secondary	Primary (Mould board plough, Disc plough) and secondary tillage (Cultivator and harrows) implements. Field operation of line sowing equipment (Seed drill, transplanter), SRI method of



		<p>tillage implements (Cultivator and Harrow). (6 hrs)</p> <p>88. Practice field operation of seed drill. (6Hrs)</p> <p>89. Calibrate seed cum fertilizer drill/ planter. (8 hrs)</p> <p>90. Practice operation of manual and power weeder. (8 hrs)</p> <p>91. Practice adjustment and operation of tractor. (6 hrs)</p> <p>92. Practice operation of power tiller with matching implements. (8 hrs)</p> <p>93. Practice operation of pedal operated, power operated and axial flow threshers. (8 hrs)</p> <p>93. Practice operation of paddy transplanters. (6 hrs)</p> <p>94. Practice operation of sprayers. (4hrs)</p>	<p>planting with marker, Repair and maintenance of tractor, Power tiller and matching implements, Operation.</p> <p>Operation and maintenance of harvesting tools (improved sickle, power reaper)</p> <p>Operation and maintenance of pedal operated thresher, power thresher-cum-winnower, and Axial flow thresher.</p> <p>Precautionary measures in operation of sprayers and dusters,</p> <p>Study of herbicide application equipment and calibration.</p>
<p>31-32</p>	<ul style="list-style-type: none"> <li>Perform seed testing, processing and packaging.</li> </ul>	<p>95. Identify various seeds and plants. (2 hrs)</p> <p>96. Extract seeds from important crops. (2 hrs)</p> <p>97. Collect seed samples accurately for testing using mixing and dividing equipment. (6 hrs)</p> <p>98. Perform purity analysis for various seeds. (4 hrs)</p> <p>99. Carry out seed germination test for various species. (6 hrs)</p> <p>100. Perform tetrazolium test for germination of various seeds. (5 hrs)</p> <p>101. Determine moisture content in various seeds by direct and indirect method. (6 hrs)</p> <p>102. Determine seed weight of seed lot for selected species. (4 hrs)</p>	<p>Plant reproduction and seed development; seed anatomy and morphology.</p> <p>Significance of seed quality</p> <p>Process of seed germination</p> <p>Effects of seed moisture on seed quality</p> <p>Effect of drying temperature and duration on seed germination</p> <p>Drying methods - importance and factors affecting</p> <p>Seeds-methods of propagation, selection of seeds, quality of seed</p>



		<p>103. Perform seed vigour test. (4 hrs)</p> <p>104. Evaluate seed viability at different RH/ temperature levels and packaging materials. (6 hrs)</p> <p>105. Practice seed drying methods. (6 hrs)</p> <p>106. Practice seed packaging viz. moisture pervious, moisture impervious and moisture resistant etc. (5 hrs)</p> <p>107. Prepare seed analysis report. (4 hrs)</p>	
33-34	<ul style="list-style-type: none"> <li>Undertake crop cultivation, soil and irrigation water management.</li> </ul>	<p>108. Practice field preparation, make plots, ridges and raised beds. (6 hrs)</p> <p>109. Transplant paddy to develop Nursery. (4 hrs)</p> <p>110. Incorporate crop with green manuring. (4 hrs)</p> <p>111. Determine field capacity by field method. (6 hrs)</p> <p>112. Determine water requirement for irrigation. (6 hrs)</p> <p>113. Demonstrate furrow method of irrigation. (8 hrs)</p> <p>114. Demonstrate check basin and basin method of irrigation. (10 hrs)</p> <p>115. Erect and perform operation of sprinkler irrigation system. (10 hrs)</p> <p>116. Determine irrigation water use efficiency. (6 hrs)</p>	<p>Nursery raising techniques, Methods of transplanting</p> <p>Climate and environment effect on plant growth.</p> <p>Sowing/planting times and methods, Intercultural operations, physiological disorders, harvesting, cool and warm season vegetables.</p> <p>Importance of water in crop production.</p> <p>Water requirement of crops and factors affecting it.</p> <p>Quantity and quality of irrigation water.</p> <p>Systems and methods of irrigation; drip, sprinkler and mist Irrigation etc.</p>
35	<ul style="list-style-type: none"> <li>Identify plant diseases and implement integrated pests management.</li> </ul>	<p>117. Identify various plant diseases and their symptom. (6 hrs)</p> <p>118. Practice control measures of crop diseases for following crops: Rice,</p>	<p>Introduction, important plant pathogenic organisms, different groups, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, viruses, virioids, algae, protozoa</p>



		<p>sorghum, wheat, bajra maize, sugarcane, turmeric tobacco, groundnut, castor sunflower, sesame, cotton, red gram, green gram, black gram, Bengal gram and beans etc. (18 hrs)</p> <p>119. Visit nearby farm for control measures of crop diseases. (6 hrs)</p>	<p>and phanerogamic parasites with examples of disease caused by them.</p> <p>Economic importance, symptoms, cause, epidemiology, disease cycle and integrated management of various diseases.</p>
36-37	<ul style="list-style-type: none"> <li>Identify plant diseases and implement integrated pests management.</li> </ul>	<p>120. Identify crop pests with symptoms of damage in major crops belonging to cereals, pulses, oil seeds, fibre crops, sugar cane, important vegetables and plantation crops. (6 hrs)</p> <p>121. Predict the times when the pest pressure is most severe in different crops. (4 hrs)</p> <p>122. Practice on suitable integrated pests management techniques: (30 hrs)</p> <ol style="list-style-type: none"> <li>Cultural control</li> <li>Mechanical control</li> <li>Sanitary control</li> <li>Natural control</li> <li>Biological control</li> <li>Hot plant resistance</li> <li>Use of pesticides, herbicides</li> </ol> <p>123. Practice integrated pests management in Rabi crops. (10 hrs)</p> <p>124. Practice integrated pests management in Kharif crops. (10 hrs)</p>	<p>Damage from insect/pests to major field crops.</p> <p>Regional forecast of the timing of activity of different pests.</p> <p>Integrated pests management techniques.</p>
38-39	<ul style="list-style-type: none"> <li>Undertake application of fertilizers for various crops.</li> </ul>	<p>125. Identify various inorganic fertilizers. (4 hrs)</p> <p>126. Practice application of fertilizer by different</p>	<p>Composts-Different methods, Mechanical compost plants, Vermin composting, Green manures, oil cakes, sewage and</p>





		<p>methods. Knowledge of mixing fertilizers with other fertilizers and amendments. (20 hrs)</p> <p>a) Deep soil placement method</p> <p>b) Broadcasting</p> <p>c) Banding</p> <p>d) Foliar application and norms for combining fertilizers with other agrochemicals</p> <p>127. Practice application of fertilizers through irrigation water (fertigation). (4 hrs)</p> <p>128. Practice on preparation of compost from organic waste. (10 hrs)</p> <p>129. Practice use of primary fertilizers (N-P-K) in crops. (6 hrs)</p> <p>130. Practice using secondary fertilizers (N, P, K, Ca, Mg, S) in crops. (6 hrs)</p> <p>131. Practice optimum use of fertilizers in crops. (4 hrs)</p> <p>132. Practice safe methods of fertilizer storage and handling. (6 hrs)</p>	<p>sludge-Biogas plant slurry, plant and animal refuges, Fertilizers-classification. Manufacturing processes and properties of major nitrogenous, Phosphatic, Potassic and complex fertilizers, their fate and reactions in the soil. Secondary and micronutrients fertilizers, Amendments. Fertilizer control order, fertilizer storage, Bio-fertilizers and their advantage. Adulteration in fertilizer, compatibility of fertilizers with pesticides.</p>
<p>40-42</p>	<ul style="list-style-type: none"> <li>Undertake crop cultivation, soil and irrigation water management.</li> </ul>	<p>133. Identify Kharif crops and their seeds. (4 hrs)</p> <p>134. Identify field implements. (4 hrs)</p> <p>135. Calculate fertilizer doses for kharif crops. (4 hrs)</p> <p>136. Practice cultivation of pigeon pea, moong bean, urd bean, groundnut, sesame, soybean etc. (24 hrs)</p> <p>137. Identify Kharif season weeds. (4 hrs)</p> <p>138. Practice cultivation of Kharif crops viz. Rice,</p>	<p>Classification of crops</p> <p>Kharif crops; Soil and climatic requirement, improved varieties, cultivation practices, yield and economic importance of rice, maize, sorghum, pear millet, minor millets.</p> <p>System of rice intensification (SRI)</p> <p>Weeds-characteristics, losses caused by weeds, dissemination, competition and methods of control.</p>



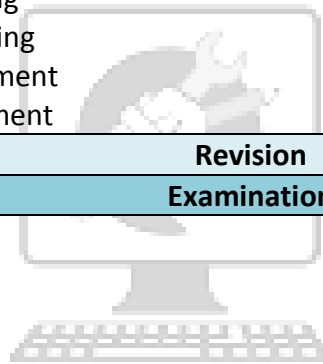
		<p>maize, sorghum, pear millet, minor millets etc. (24 hrs)</p> <p>139. Examine the maturity of crops and estimate the yields. (6 hrs)</p> <p>140. Practices of different sowing methods in combine harvested fields. (12 hrs)</p> <p>141. Practice operation of Paddy straw management machinery. (8 hrs)</p>	<p>Different straw management machines and uses of paddy straw.</p>
<p>43-45</p>	<ul style="list-style-type: none"> <li>Undertake crop cultivation, soil and irrigation water management.</li> </ul>	<p>142. Identify different Rabi crops and their seeds. (4 hrs)</p> <p>143. Identify weeds of Rabi crops and perennial weeds. (4 hrs)</p> <p>144. Practice seed bed preparation and sowing of wheat, maize, sugarcane and sunflower. (12 hrs)</p> <p>145. Determine seed rate for Rabi crops (wheat and mustard). (6 hrs)</p> <p>146. Determine fertilizer doses for Rabi crops. (6 hrs)</p> <p>147. Identify weeds in wheat and grain legumes. (6 hrs)</p> <p>148. Practice planting of beet and potato. (8 hrs)</p> <p>149. Analyse quality of sugarcane. (4 hrs)</p> <p>150. Estimate yield of rabi crops. (6 hrs)</p> <p>151. Examine the maturity stage of different Rabi crops. (8 hrs)</p> <p>152. Practice agronomic traits for Rabi crops. (8 hrs)</p> <p>153. Practice threshing, and drying, winnowing and safe storage of produce. (10</p>	<p>Classification of crops; <i>Rabi</i> crops.</p> <p>Soil and climatic requirement, improved varieties, cultivation practices, yield and economic importance of Wheat, barley, chickpea, lentil, peas, rapeseed and mustard etc.</p> <p>Cropping system, Crop rotation, Multiple Cropping, Mixed Cropping and Intercropping.</p> <p>Economic importance of forage crops, berseem, shaftal, lucerne, oats, ryegrass, senji. Hay and silage making.</p> <p>Crop residue management, benefits and different methods.</p> <p>Different methods of threshing of rabi crops, Threshers and Combines.</p> <p>Storage of grains.</p>



		hrs) 154. Determine moisture content of grains. (8 hrs)	
46	<ul style="list-style-type: none"> <li>Undertake organic farming, soil, vermin compost &amp; pests management.</li> </ul>	155. Prepare and use compost by food waste. (7 hrs) 156. Prepare and use green manure. (6 hrs) 157. Practice use of drip irrigation for vegetable plants. (8 hrs) 158. Practice use of vermin compost and residual waste in crops. (4 hrs) 159. Practice use of bio-control agents and bio pesticides for pests management. (4 hrs)	The principal methods of organic farming include crop rotation, green manures and compost, biological pest control, and mechanical cultivation.  Organic certification in brief.  Green house technology / low cost green houses / utility of green houses.
47	<ul style="list-style-type: none"> <li>Undertake optimal use of water and recommend quantum &amp; interval at which watering to be done in crop production and micro irrigation.</li> </ul>	160. Undertake economical use of water and perform related activities for regeneration of ground water. (6 hrs) 161. Water harvesting and recommend quantum and interval at which watering is to be done for crop production. (6 hrs) 162. Undertake suitable water saving techniques for sustainable water conservation. (6 hrs) 163. Undertake precision water harvesting and carry out micro-irrigation. (6 hrs) 164. Carry out different modern techniques for saving and preservation of water. (6 hrs)	Importance of rain water harvesting. Precision water harvesting Water harvesting techniques Percolation pit
48	<ul style="list-style-type: none"> <li>Prepare report on various aspects of farming.</li> </ul>	165. Prepare a report for setting a net /poly houses. (6 hrs) 166. Plan and prepare a report to establish soil testing	Definitions, meaning and Role of agricultural marketing. Scope of agricultural marketing, Process of



		laboratory. (6 hrs) 167. Plan and prepare a report to setup a nursery. (6 hrs) 168. Plan and prepare a report to setup agriculture product marketing. (6 hrs) 169. Prepare a report for waste management and produce organic manure. (6 hrs)	agricultural marketing Role of government in agricultural marketing. Food corporation of India, Quality control of agricultural products, AGMARK, contract farming.
49-50	Project work / Industrial visit Broad Areas: a) Organic farming b) Water harvesting c) Pests management d) Seed management		
51	<b>Revision</b>		
52	<b>Examination</b>		



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## 9. SYLLABUS – CORE SKILL

CORE SKILL - EMPLOYABILITY SKILL		
<b>1<sup>st</sup> Semester</b>		
<b>1. English Literacy</b>		Duration : 20 Hrs. Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.	
Reading	Reading and understanding simple sentences about self, work and environment	
Writing	Construction of simple sentences Writing simple English	
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.	
<b>2. IT Literacy</b>		Duration : 20 Hrs. Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.	
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.	



Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.	
<b>3. Communication Skills</b>		Duration : 15 Hrs. Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.	
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.	
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.	
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.	
Behavioral Skills	Problem Solving Confidence Building Attitude	
<b>2<sup>nd</sup> Semester</b>		
<b>4. Entrepreneurship Skills</b>		Duration : 15 Hrs.



		Marks : 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.	
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
<b>5. Productivity</b>		Duration : 10 Hrs. Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.	
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.	
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.	
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
<b>6. Occupational Safety, Health and Environment Education</b>		Duration : 15 Hrs. Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.	
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	



Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
<b>7. Labour Welfare Legislation</b>	
	Duration : 05 Hrs. Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
<b>8. Quality Tools</b>	
	Duration : 10 Hrs. Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.





House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.



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<b>LIST OF TOOLS &amp; EQUIPMENTS</b>			
<b>SOIL TESTING AND CROP TECHNICIAN</b>			
<b>Sl. No.</b>	<b>Name of the Tools and Equipment</b>	<b>Specification</b>	<b>Quantity</b>
<b>A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-6 is required additionally)</b>			
1.	Apron		20
2.	Spade		20
3.	Sickle		20
4.	Khurpa		20
5.	Kasola		20
6.	Trifali		20
<b>B. SHOP TOOLS &amp; EQUIPMENT</b>			
<b>(i) Tools, instruments and lab apparatus</b>			
7.	Measuring tape		04
8.	Zindra		05
9.	Dori (Nylon rope)		10
10.	Wheel hand hoe		05
11.	pH meter		02
12.	Electrical conductivity meter		02
13.	Flame photometer		01
14.	Spectrophotometer		01
15.	Atomic absorption spectrophotometer		01
16.	Shaking apparatus		01
17.	Distillation unit	Quartz	01
18.	Ammonia distillation unit (with heaters)		01
19.	Sieves		10
20.	Four digit weighing balance		02
21.	Ordinary physical balance		02
22.	Gas connection		01
23.	Sampling tools (augers)		05
24.	Refrigerator (165 Ltr)		01
25.	Gas cylinders with regulators	a) LPG b) Acetylene	02 Each



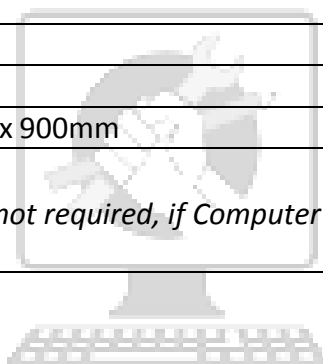
		c) Nitrous Oxide	
26.	Incubator (with temperature control)		01
27.	Infrared soil moisture estimation unit		01
28.	Electric oven	With fan and temperature regulation	01
29.	Soil cores	Designed for Bulk density determination	01
30.	Soil infiltrator meter		01
31.	GPS system with mobile phone		02
32.	Table top centrifuge		01
33.	Auto Titrater		01
<b>(ii) List of Equipment</b>			
34.	Temperature controlled horizontal Shaker	With clamps to hold 150 ml conical flasks	02
35.	Hot plates	(3' x 2')	01
36.	Wooden roller		02
37.	Wooden Trays with racks		01
38.	Cabinets	To store soil samples till complete soil analysis	01
39.	Soil mixer		01
<b>C. Shop Machinery -</b>			
40.	Seed cum fertilizer drill		01
41.	Manual seed drill		01
42.	Manual multi crop planter		01
43.	Paddy transplanter		01
44.	Bed planter		01
45.	Ridger		01
46.	Tractor		01
47.	Cultivator		01
48.	Disc harrow		01
49.	Planker		01
50.	Knapsack sprayer		02
51.	Vertical conveyor reaper		01
52.	Multi crop Thresher		01
53.	Soil testing laboratory		01
54.	Field for raising crops		1 acre (minimum)
<b>D. List of Consumable</b>			
55.	Seeds	different Rabi and Kharif crops	As per



			requirement
56.	Fertilizers	Urea, DAP, SSP, MOP	-do-
57.	Spraying chemicals		-do-
58.	Soil and water test report cards		100
59.	Chemicals for soil testing lab		As per list
60.	Glassware for soil testing lab		As per list
<b>E. Shop Floor Furniture and Materials -</b>			
61.	Computer Chair		1+1
62.	Computer Table		1+1
63.	Desktop computer and related MS office software		1+1
64.	Fire Extinguishers, first- aid box		One each
65.	Internet connection	with all accessories	As required
66.	Laser printer		1
67.	LCD projector/ LED /LCD TV	42"	1
68.	Stools		20
69.	Suitable class room furniture		As required
70.	Suitable Work Tables with vices		As required
71.	Trainees locker 6½ ' x 3' x 1½'	To accommodate 20 Lockers	2 Nos.
72.	Plastic tubs / Buckets		04
<b>Note:</b> - All the tools and equipment are to be procured as per BIS specification.			

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TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	Name of the Equipment	Quantity
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
<p><b>Note:</b> - Above Tools &amp; Equipments not required, if Computer LAB is available in the institute.</p>		



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**FORMAT FOR INTERNAL ASSESSMENT**

<b>Name &amp; Address of the Assessor :</b>		<b>Year of Enrollment :</b>												
<b>Name &amp; Address of ITI (Govt./Pvt.) :</b>		<b>Date of Assessment :</b>												
<b>Name &amp; Address of the Industry :</b>		<b>Assessment location: Industry / ITI</b>												
<b>Trade Name :</b>		<b>Semester:</b>		<b>Duration of the Trade/course:</b>										
<b>Learning Outcome:</b>														
SI. No	Maximum Marks (Total 100 Marks)		15	5	10	5	10	10	5	10	15	15	Total internal assessment Marks	Result (Y/N)
	Candidate Name	Father's/Mother's Name	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA		
1														
2														