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

**COMPETENCY BASED CURRICULUM**

# SOIL TESTINGAND CROP TECHNICIAN

**(Duration: One Year)**

## CRAFTSMEN TRAINING SCHEME (CTS)

**NSQF LEVEL- 3.5**

## SECTOR – AGRICULTURE

Directorate General of Training

# SOIL TESTING AND CROP TECHNICIAN

(Non-Engineering Trade)

**(Revised in March 2023)**

**Version: 2.0**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL- 3.5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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# 1. COURSE INFORMATION

During the one-year duration of "Soil Testing and Crop Technician" trade a candidate is trained on professional skill, professional knowledge and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered under Professional Skill subject are as below:-

This course primarily deals with soil testing. The trainee learns about safety and environment, Elementary first aid and firefighting. He gets the idea of trade tools, apparatus & their standardization, calibration and 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.

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 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.

## 2.1GENERAL

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

CTS courses are delivered nationwide through network of ITIs. The course 'Soil Testing and Crop Technician' is of one-year 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 program, the trainee is awarded National Trade Certificate (NTC) by DGTwhich is recognized worldwide.

### Trainees need 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 PROGRESSION PATHWAYS

- Can join industry as Crop Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Fertilizer and seed industry as entry level skilled worker.
- Can join Soil testing laboratories as sample collector and field-testing technician.
- Can become entrepreneur in the field of crop development, soil testing, seeds and fertilizers.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

## 2.3 COURSE STRUCTURE

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

| S No. | Course Element | Notional Training Hours |
|---|---|---|
| 1 | Professional Skill (Trade Practical) | 840 |
| 2 | Professional Knowledge (Trade Theory) | 240 |
| 3 | Employability Skills | 120 |
| | **Total** | **1200** |

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry wherever not available then group project is mandatory.

| | |
|---|---|
| On the Job Training (OJT)/ Group Project | 150 |
| Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses) | 240 |

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

## 2.4 ASSESSMENT & CERTIFICATION

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

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

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTCwill be conducted by Controller of examinations, DGTas per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be 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

For the purposes of determining the overall result, weightage of 100% is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

## 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.

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
- Computer based multiple choice question examination
- Practical Examination

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

| Performance Level | Evidence |
|---|---|
| (a) Marks in the range of 60 -75% to be allotted during assessment | |

| | |
|---|---|
| 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. | • Demonstration of good skills and accuracy in the field of work/ assignments.<br>• A fairly good level of neatness and consistency to accomplish job activities.<br>• Occasional support in completing the task/ job. |
| (b)Marks in the range of above75% - 90% to be allotted during assessment | |
| 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. | • Good skill levels and accuracy in the field of work/ assignments.<br>• A good level of neatness and consistency to accomplish job activities.<br>• Little support in completing the task/job. |
| (c) Marks in the range of above 90% to be allotted during assessment | |
| For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship. | • High skill levels and accuracy in the field of work/ assignments.<br>• A high level of neatness and consistency to accomplish job activities.<br>• Minimal or no support in completing the task/ job. |

## 3. JOB ROLE

**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, fertilizes 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 soft enearth 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. Conduct sweeding 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 breedanimals.

**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, fertilizers 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 ground and leveling 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 marketplace 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:**

a) 3111.0200 – Laboratory Assistant, Soil
b) 6111.0101 – Paddy Farmer
c) 6111.0200 – Cultivator, Crop
d) 6111.1300 – Cultivator, Vegetables

**Referenced NOS:**

a) AGR/N8112
b) AGR/N8113
c) AGR/N8105
d) AGR/N8101
e) AGR/N8108
f) AGR/N8109
g) AGR/N8110
h) AGR/N9404
i) AGR/N1107
j) AGR/N1108
k) AGR/N1143
l) AGR/N1144
m) AGR/N1101
n) AGR/N7112
o) AGR/N7106
p) AGR/N7107
q) AGR/N7108
r) AGR/N0111
s) AGR/N0124
t) AGR/N0123
u) AGR/N0122
v) AGR/N0121
w) AGR/N0109
x) AGR/N0125
y) AGR/N0108
z) AGR/N9405

# 4. GENERAL INFORMATION

| | |
|---|---|
| **Name of the Trade** | **SOIL TESTING AND CROP TECHNICIAN** |
| **Trade Code** | DGT/2002 |
| **NCO - 2015** | 3111.0200, 6111.0101, 6111.0200, 6111.1300 |
| **NOS Covered** | AGR/N8112, AGR/N8113, AGR/N8105, AGR/N8101, AGR/N8108, AGR/N8109, AGR/N8110, AGR/N9404, AGR/N1107, AGR/N1108, AGR/N1143, AGR/N1144, AGR/N1101, AGR/N7112, AGR/N7106, AGR/N7107, AGR/N7108, AGR/N0111, AGR/N0124, AGR/N0123, AGR/N0122, AGR/N0121, AGR/N0109, AGR/N0125, AGR/N0108, AGR/N9405 |
| **NSQF Level** | Level 3.5 |
| **Duration of Craftsmen Training** | One Year (1200 + 150 Hours OJT/Group Project) |
| **Entry Qualification** | Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent. |
| **Minimum Age** | 14 years as on first day of academic session. |
| **Eligibility for PwD** | LD, CP, LC, DW, AA, LV, DEAF, HH, AUTISM, ID, SLD |
| **Unit Strength (No. Of Student)** | 24(There is no separate provision of supernumerary seats) |
| **Space Norms** | (i) 200 Sq. Metres<br>(ii) 1 Acre Farming Land |
| **Power Norms** | 2 KW |
| **Instructors Qualification for** | |
| **(i) 'Soil Testing and Crop Technician' Trade** | B.Voc/ BSc. (Ag)/ B. Tech. (Ag) from AICTE/UGC recognised university with one-year experience in relevant field.<br>**OR**<br>Diploma(Minimum 2 years)(Ag) from recognised board of education or relevant Advanced Diploma (Vocational)with two-years experience in relevant field.<br>**OR**<br>NTC/NAC passed in the trade of "Soil Testing and Crop Technician" with Three-year experience in relevant field.<br><br>**Essential Qualification:**<br>Relevant Regular/RPL variants of National Craft Instructor Certificate (NCIC) under DGT. |

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| | **Note**<br>**Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.** |
| **(ii) Employability Skill** | MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills.<br><br>(Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above)<br>**OR**<br>Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills. |
| **(iii) Minimum Age for Instructor** | 21 Years |
| **List of Tools and Equipment** | As per Annexure – I |

# 5. LEARNING OUTCOME

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

## 5.1 LEARNING OUTCOME:

1. Collect sample from agricultural field and prepare sample for soil testing following safety precautions.(NOS: AGR/N8112, AGR/N8113, AGR/N8105)
2. Perform soil testing to identify the different components in the soil. (NOS: AGR/N8101, AGR/N8108)
3. Perform testing of irrigation water to determine various properties and chemical agents. (NOS: AGR/N8109)
4. Calculate nutrients from different fertilizer sources, recommend appropriate fertilizer, quantum of dose and distribution of fertilizer based on the soil properties. (NOS: AGR/N8110)
5. Use GPS/GIS in collection of data for input recommendation. (NOS: AGR/N8112, AGR/N8110)
6. Measure environmental parameters for crop production. (NOS: AGR/N9404)
7. Operate farming machines viz. Seed drill, tractor, power weeder, paddy transplanter and threshers etc. (NOS: AGR/N1107, AGR/N1108, AGR/N1110, AGR/N1143, AGR/N1144, AGR/N1101)
8. Perform seed testing, processing and packaging. (NOS: AGR/N7112, AGR/N7106, AGR/N7107, AGR/N7108)
9. Perform crop cultivation, soil and irrigation water management. (NOS: AGR/N0111, AGR/N0124, AGR/N0123, AGR/N0122, AGR/N0121)
10. Identify plant diseases and implement integrated pests management. (NOS: AGR/N0109, AGR/N0125)
11. Perform application of fertilizers for various crops. (NOS: AGR/N0108)
12. Perform organic farming, soil, vermin compost & pests management. (NOS: AGR/N0108, AGR/N0125)
13. Recommend optimal use of water, quantum & interval at which watering to be done in crop production and use of micro irrigation devices. (NOS: AGR/N0111)
14. Prepare report on various aspects of farming. (NOS: AGR/N9405)

# 6. ASSESSMENT CRITERIA

| LEARNING OUTCOMES | ASSESSMENT CRITERIA |
|---|---|
| 1. Collect sample from agricultural field and prepare sample for soil testing following safety precautions. (NOS: AGR/N8112, AGR/N8113, AGR/N8105) | Make sampling plan to collect soil samples. |
| | Identify soil sampling equipment/ apparatus. |
| | Collect soil samples and prepare for testing. |
| | Demonstrate various chemical reagents required for soil testing. |
| | |
| 2. Perform soil testing to identify the different components in the soil. (NOS: AGR/N8101, AGR/N8108) | Identify apparatus / equipment for soil testing. |
| | Observe safety/ precaution during work |
| | Determine soil texture. |
| | Determine pH value of soil sample by electrometric and potentiometric method. |
| | Determine organic carbon in soil. |
| | Determine electrical conductivity of soils. |
| | Determine calcium carbonate in soil by rapid titration method. |
| | Determine N, P, K, Na, S, Ca, Mg in soil and demonstrate procedure. |
| | Determine cation exchange capacity of soil. |
| | Determine gypsum requirement of alkali soil. |
| | Determine lime requirement of deiclic soil. |
| | Prepare soil test report. |
| | Prepare soil test summery and soil health card. |
| | |
| 3. Perform testing of irrigation water to determine various properties and chemical agents. (NOS: AGR/N8109) | Identify apparatus / equipment for soil testing. |
| | Observe safety/ precaution during work. |
| | Determine pH value and electrical conductivity of water. |
| | Determine carbonates and bicarbonates in water. |
| | Determine Ca, Mg, N and chlorides in water. |
| | Determine rainfall erosivity and soil erodibility indices. |
| | Extract and determine micronutrients in water |
| | |
| 4. Calculate nutrients from different fertilizer sources, recommend appropriate fertilizer, quantum of dose and distribution of fertilizer | Determine total nitrogen and phosphorus in manures/ composts. |
| | Determine ammonical, nitrate nitrogen, water soluble $P_2O_5$, potassium, calcium and sulphur contents of fertilizers. |
| | Perform BOD (Biochemical oxygen demand) in organic wastes. |
| | Perform COD (Chemical oxygen demand) in organic wastes. |
| | Recommend fertilizer with the help of software. |

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| based on the soil properties. (NOS: AGR/N8110) | As per soil texture recommend quantum of dose and distribution of fertilizer. |
| | |
| 5. Use GPS/GIS in collection of data for input recommendation. (NOS: AGR/N8112, AGR/N8110) | Demonstrate GPS / GIS equipment and set up for operation. |
| | Collect location information by GPS receivers for mapping field boundaries and irrigation systems. |
| | Navigate to specific locations in the field to collect soil sample data or monitor crop conditions. |
| | Locate problem areas in crops for input recommendations. |
| | |
| 6. Measure environmental parameters for crop production. (NOS: AGR/N9404) | Measure rainfall, atmospheric pressure. |
| | Measure wind speed and wind direction etc. |
| | Measure relative humidity. |
| | Measure sunshine duration and solar radiation. |
| | |
| 7. Operate and perform basic maintenance of farming machines viz. Seed drill, tractor, power weeder, paddy transplanter and threshers Etc. (NOS: AGR/N1107, AGR/N1108, AGR/N1110, AGR/N1143, AGR/N1144, AGR/N1101) | Identify and demonstrate parts of seed drill and power weeder. |
| | Identify and demonstrate parts of power tiller and threshers. |
| | Demonstrate operation of seed drill. |
| | Demonstrate operation of power weeder. |
| | Demonstrate operation of power tiller. |
| | Demonstrate operation of power operated thresher. |
| | Demonstrate operation of paddy transplanter. |
| | Demonstrate field preparation. |
| | |
| 8. Perform seed testing, processing and packaging. (NOS: AGR/N7112, AGR/N7106, AGR/N7107, AGR/N7108) | Demonstrate various seeds and plants. |
| | Demonstrate procedure of seed testing. |
| | Demonstrate seed processing. |
| | Demonstrate packaging of seed. |
| | |
| 9. Perform crop cultivation, soil and irrigation water management. (NOS: AGR/N0111, AGR/N0124, AGR/N0123, AGR/N0122, AGR/N0121) | Determine field capacity and water requirement for irrigation. |
| | Identify various rabi and kharif crop seeds. |
| | Demonstrate/ explain furrow method of irrigation. |
| | Demonstrate/ explain check basin and basin method of irrigation. |
| | Demonstrate operation of sprinkler irrigation system. |
| | Demonstrate various plant diseases. |
| | Demonstrate pests management for rabi and kharif crops. |
| | Demonstrate operation of paddy straw management machinery. |

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| | Determine irrigation water use efficiency. |
| | Determine moisture content in grains. |
| | Demonstrate safe storage practices of grains. |
| | |
| 10. Identify plant diseases and implement integrated pests management. (NOS: AGR/N0109, AGR/N0125) | Identify crop pests with symptoms of damage in crops. |
| | Demonstrate cultural control technique for integrated pests management. |
| | Demonstrate mechanical control technique for integrated pests management. |
| | Demonstrate sanitary control technique for integrated pests management. |
| | Demonstrate natural control technique for integrated pests management. |
| | Identify different pesticides, herbicides, fungicides, weedicides etc. |
| | |
| 11. Perform application of fertilizers for various crops. (NOS: AGR/N0108) | Identify various inorganic fertilizers. |
| | Demonstrate any two methods of application of fertilizer. |
| | Demonstrate application of fertilizers through irrigation water. |
| | Demonstrate method of preparation of compost from organic waste. |
| | Demonstrate safe methods of fertilizer storage and handling. |
| | |
| 12. Perform organic farming, soil, vermin compost & pests management. (NOS: AGR/N0108, AGR/N0125) | Demonstrate use of vermin compost and residual waste in crops. |
| | Demonstrate use of organic fertilizer. |
| | Demonstrate use of bio-control agents and bio pesticides for pests management. |
| | Demonstrate drip irrigation method. |
| | |
| 13. Recommend optimal use of water, quantum & interval at which watering to be done in crop production and micro irrigation. (NOS: AGR/N0111) | Demonstrate water harvesting techniques. |
| | Determine quantum of water for specific crop and soil. |
| | Determine interval of irrigation water for different types of crops. |
| | Demonstrate precision water harvesting and micro irrigation. |
| | |
| 14. Prepare report on various aspects of farming. (NOS: AGR/N9405) | Reports prepared on various topics will be assessed. |
| | Setting a Net /poly houses. |
| | Establish soil testing laboratory. |
| | Setup a nursery. |
| | Setup agriculture product marketing. |
| | Waste management and produce organic manure. |
| | |

| SYLLABUS FOR SOIL TESTING AND CROP TECHNICIAN TRADE | | | |
|---|---|---|---|
| **DURATION: ONE YEAR** | | | |
| **Duration** | **Reference Learning Outcome** | **Professional Skills (Trade Practical)** | **Professional Knowledge (Trade Theory)** |
| Professional Skill 42Hrs;<br><br>Professional Knowledge 12Hrs | Collect sample from agricultural field and prepare sample for soil testing following safety precautions. | 1. Identify safety symbols and hazards.<br>2. Practice preventive measures to avoid accidents in laboratories.<br>3. Identify factors for different chemicals accident (Eye accident, Burning reagents, Cloth burns, Skin burns, Poisons, Gas and Cuts etc.)<br>4. Practice safe methods of fire fighting.<br>5. Practice elementary first aid.<br>6. Practice on cleanliness and procedure to maintain it. | Importance of the trade.<br>Physical and chemical properties of Soil and their influence on crop and water productivity.<br><br>Fertility status of soils, soil deficiency with respect to macro and micronutrient components, their sources & Importance. Remedial measures to overcome deficiency.<br>Material safety data sheet (MSDS) of chemicals and acids. |
| | | 7. Identify various laboratory apparatus.<br>8. Demonstrate handling procedure for collection of soil samples.<br>9. Make sampling plan and collect representative soil samples.<br>10. Collect and prepare soil samples for fertility evaluation.<br>11. Record local land features like % slope and drainage characteristic.<br>12. Collect composite samples with following composite | Soil texture, Soil bulk density, infiltration rate, soil aggregation, soil temperature and soil aeration.<br>Requirements of Soil sampling for reclamation for garden plantation;<br><br>Laboratory Layout, built up area, Laboratory requirements, working pattern, budget requirement, trained manpower, various funding schemes and agencies. |

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| | | sampling procedure.<br>13. Practice on processing / grinding of samples for analysis and sample storage. | |
| Professional Skill 230 Hrs;<br><br>Professional Knowledge 66 Hrs | Perform soil testing to identify the different components in the soil. | 14. Practice on handling of electrical balances, pipettes, burettes and solutions.<br>15. Prepare standard solutions.<br>16. Prepare various chemical reagents required for soil testing.<br>17. Prepare buffer solution and determine molarity, normality and equivalent weight.<br>18. Prepare standard solutions of hydrochloric acid of different concentrations. | The soil organic matter and its importance in maintaining soil quality.<br>Soil mineralogy and its significance.<br><br>Standardization of secondary standard<br>Neutralization reactions |
| | | 19. Determine soil texture by Feel Method.<br>20. Determine soil texture by Ribbon formation.<br>21. Determine soil texture by International Pipette Method.<br>22. Determine soil texture by Buoyancy Hydrometer method.<br>23. Determine saturation moisture percentage (water holding capacity.<br>24. Determine bulk density by Weighing bottle method.<br>25. Determine bulk density by Clod method.<br>26. Determine bulk density by Core method.<br>27. Determine hydraulic conductivity of Soil by | Importance of Soil Texture.<br>Soil properties affecting the determination of Texture.<br>Soil biological properties and organisms in soil.<br>Earthworms and their role in soil.<br>Role of bacteria, fungi and actinomycetes in soil.<br>Bio-fertlizers and their use in agriculture.<br>Essential nutrients for crop growth.<br>Role of macro and micronutrients in plant growth.<br>Precautions in the use of pH meter.<br>Importance of Soil Testing and Analysis.<br>Brief study of instruments :pH Meter, Conductivity meter, |

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|---|---|---|---|
| | | constant head method.<br>28. Determine hydraulic conductivity of soil by falling head method.<br>29. Determine soil moisture content by gravimetric method.<br>30. Determine soil moisture content by Infrared moisture meter method. | spectrometer/ colorimeter, UV-Spectrophotometer, atomic absorption spectrophotometer<br>Use of soil testing kit and mobile soil testing van.<br>Various methods for conducting soil tests. |
| | | 31. Determine pH value of soil sample by Electrometric method.<br>32. Determine pH value of soil sample by Potentiometric method using glass electrode pH meter.<br>33. Determine electrical conductivity of soils. | Effect of water content on soil pH, determination of soil pH.<br>Principle of Potentiometric method, Glass electrode pH meter and maintenance of electrodes.<br>Electrical conductivity of soils, Principle of Soil electrical conductivity meter, purpose, apparatus, determination of cell constant, temperature correction.<br>Precautions in using electrical conductivity meter. |
| | | 34. Determine organic carbon in soils by modified Walkely & Black Method.<br>35. Determine organic carbon in soils by spectrophotometer method.<br>36. Determine organic carbon in soils by Dry combustion method.<br>37. Determine organic carbon in soils by Wet combustion method.<br>38. Determine rating of soil according to organic carbon value. | Amelioration of nutrient deficiencies in different crops.<br>Soil and foliar application of different nutrients with necessary precautions.<br>Purpose to assess the fertility level of soil.<br>Reagents, Dry combustion method, Wet combustion method, their principles.<br>Oxidation and titration reactions, interpretation and rating of soil according to organic carbon value. |

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| | | 39. Determine calcium carbonate (free lime) in soil by acid neutralisation method.<br>40. Determine calcium carbonate in soil by schrotus apparatus method.<br>41. Determine calcium carbonate in soil by Hutchinson and Maclonnan Method.<br>42. Determine calcium carbonate in soil by Rapid Titration Method.<br>43. Determine calcium carbonate in soil by Modified Passion's Method.<br>44. Determine calcium carbonate in soil by Puri's Method. | Principle, calculations and interpretation for determination of calcium carbonate. |
| | | 45. Determine Nitrogen by alkaline potassium permanganate method.<br>46. Determine Phosphorus in soils by Olsen's method.<br>47. Determine Potassium in soils by flame photometer.<br>48. Prepare standard curve of $K_2O$ using of flame photometer.<br>49. Determine Potassium in soils by neutral normal ammonium acetate method.<br>50. Determine Sodium on flame photometer.<br>51. Determine sulphur in soils.<br>52. Determine calcium and magnesium in soil. | Determination of various nutrients in soil viz. nitrogen, phosphorus, potassium, sodium, sulphur, calcium and magnesium etc.<br>Olsen's method, apparatus, Preparation of standard curve of P, Interpretation of results and P rating in soil.<br>Principle of neutral normal ammonium acetate method.<br>Preparation of standard curve of $K_2O$ and Na.<br>Use of flame photometer.<br>Precautions while using flame photometer.<br>Use of turbid meter/ colorimeter for determination of S in soil extracts. |

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| | | | Principle of complex metric titration for determination of Ca and Mg in soil extracts. |
| | | 53. Determine Cation exchange capacity by Ammonium saturation method.<br>54. Determine Cation exchange capacity by Sodium Saturation Method.<br>55. Perform extraction of calcium chloride.<br>56. Determine gypsum requirement of alkaline soils.<br>57. Determine lime requirement of acidic soil. | Use of gypsum and conjunctive use with canal waters.<br>Cation exchange capacity.<br>Principle of calcium chloride extraction methods, reagents and apparatus required.<br>Calculation and interpretation of the results. |
| Professional Skill 63 Hrs;<br><br>Professional Knowledge 18 Hrs | Perform testing of irrigation water to determine various properties and chemical agents. | 58. Demonstrate handling procedure for collection of water samples.<br>59. Determine pH value of irrigation water.<br>60. Determine electrical conductivity of irrigation water.<br>61. Determine carbonates and bicarbonates in irrigation water.<br>62. Determine chlorides in irrigation water.<br>63. Determine calcium and magnesium in irrigation water by EDTA Titrimetric Method.<br>64. Determine Sodium on Flame Photometer.<br>65. Determine Chloride in irrigation water.<br>66. Determine sulphate in irrigation water by Colorimeter. | Quality of irrigation water and their use in agriculture.<br>Conservation agriculture and its role in saving natural resources, environment and sustaining crop productivity.<br>Salt affected soils, water logged soils, alkaline and acidic soils.<br>Reclamation of saline, alkaline and acidic soils. |

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| | | 67. Examine the quality of irrigation water –<br>i) Salinity<br>ii) Alkalinity<br>iii) Sodium adsorption ratio<br>iv) Residual Sodium carbonates (RSC)<br>v) Specific ion toxicity (Sodium, Cloride and Boron)<br>vi) Miscellaneous (BOD, Colour etc.)<br>68. Determine rainfall erosivity and soil erodibility indices. | Problem of soil erosion in India. Water and wind erosion, Mechanism, Factors affecting rainfall erosivity and soil erodibility. |
| Professional Skill 21 Hrs;<br><br>Professional Knowledge 06 Hrs | Perform soil testing to identify the different components in the soil. | 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.<br>70. Extract soil Mo by ammonium oxalate (pH 3.3) solution and determine Mo using dithiol/thiocynate method by spectrophotometer.<br>71. Extract soil micronutrient cations (Fe, Zn, Cu, and Mn) by DTPA Method and determine them by Atomic Absorption Spectrophotometer.<br>72. Compare water and DTPA extractants for a range of peat and propagation | Different agronomic and mechanical measures to control soil erosion by water and wind.<br>Determination of B in soil samples.<br>Atomic Absorption Spectroscopy,<br>Principle of Atomic Absorption Spectrophotometer.<br>Determination of available zinc, copper, iron, manganese and boron in soils.<br>Working of hollow cathode lamp<br>Principle of DTPA (di-ethylene tri-amine penta-acetic) Method. |

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| | | media samples. | |
| Professional Skill 42 Hrs;<br><br>Professional Knowledge 12Hrs | Calculate nutrients from different fertilizer sources, recommend appropriate fertilizer, quantum of dose and distribution of fertilizer based on the soil properties. | 73. Make Data entry in software for tested soil samples.<br>74. Determine total nitrogen, phosphorus and potassium in manures/ composts.<br>75. Examine ammonical, nitrate nitrogen, water soluble and 2% citric acid soluble - $P_2O_5$, water soluble - potassium, calcium and sulphur contents of fertilizers.<br>76. Perform BOD (Biochemical oxygen demand) and COD (Chemical oxygen demand) in wastewater.<br>77. Generate soil test report and recommend fertilizer.<br>78. Practice on recommendation of quantum of dose and distribution of fertilizer based on soil properties.<br>79. Prepare soil test summaries and fertility maps.<br>80. Prepare soil health card. | Preparation of Soil analysis and test report, Fertilizer recommendation.<br>Preparation of soil test summaries and fertility maps.<br>Use of website for relevant information on soil types.<br><br>Different types of fertilizers and their nutrient composition.<br>Amount, time and methods of fertilizer application. |
| Professional Skill 21 Hrs;<br><br>Professional Knowledge 06 Hrs | Use GPS/GIS in collection of data for input recommendation. | 81. Practice use of GPS/GIS and their settings.<br>82. Collect location information by GPS receivers for mapping field boundaries, irrigation systems.<br>83. Navigate to specific locations in the field, to collect soil sample data or monitor crop conditions.<br>84. Accurately locate problem areas in crops for input | Integration of on-board computers, data collection sensors, and GPS<br><br>Time and position reference systems.<br><br>Precise application of pesticides, herbicides, and fertilizers.<br><br>Optimal use of chemicals |

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| | | recommendations. | |
| Professional Skill 21 Hrs.;<br><br>Professional Knowledge 06 Hrs.; | Measure environmental parameters for crop production. | 85. Measure rainfall by Rain Gauge.<br>86. Measure temperature and evaporation (atmospheric/ soil).<br>87. Measure Atmospheric Pressure by Barometer.<br>88. Measure wind speed and direction by Anemometer and Wind vanes.<br>89. Measure sunshine duration and solar radiation by Pyranometer.<br>90. Measure Relative Humidity by Hygrometer. | 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. |
| Professional Skill 63 Hrs;<br><br>Professional Knowledge 18 Hrs | Operate farming machines viz. Seed drill, tractor, power weeder, paddy trans planter and threshers etc. | 91. Identify trade tools and equipment.<br>92. Practice on land measurement units and area calculation.<br>93. Identify different systems/parts and operations of tractors.<br>94. Practice tillage using hand tools.<br>95. Practice of ploughing.<br>96. Practice of puddling. | 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. |
| | | 97. Operate and perform adjustments in primary tillage implements (MB plough, Disc plough etc.).<br>98. Operate and perform adjustments in secondary tillage implements (Cultivator and Harrow).<br>99. Practice field operation of seed drill.<br>100. Calibrate seed cum fertilizer | Primary (Mould board plough, Disc plough) and secondary tillage (Cultivator and harrows) implements. Field operation of line sowing equipment (Seed drill, trans planter), SRI method of planting with marker, Repair and maintenance of tractor, Power tiller and matching implements, Operation. |

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| | | drill/ planter.<br>101. Practice operation of manual and power weeder.<br>102. Practice adjustment and operation of tractor.<br>103. Practice operation of power tiller with matching implements.<br>104. Practice operation of pedal operated, power operated and axial flow threshers.<br>105. Practice operation of paddy transplanters.<br>106. Practice operation of sprayers. | Operation and maintenance of harvesting tools (improved sickle, power reaper)<br>Operation and maintenance of pedal operated thresher, power thresher-cum-winnower, and Axial flow thresher.<br>Precautionary measures in operation of sprayers and dusters,<br><br>Study of herbicide application equipment and calibration. |
| Professional Skill 42 Hrs;<br><br>Professional Knowledge 12 Hrs | Perform seed testing, processing and packaging. | 107. Identify various seeds and plants.<br>108. Extract seeds from important crops.<br>109. Collect seed samples accurately for testing using mixing and dividing equipment.<br>110. Perform purity analysis for various seeds.<br>111. Carry out seed germination test for various species.<br>112. Perform tetrazolium test for germination of various seeds.<br>113. Determine moisture content in various seeds by direct and indirect method.<br>114. Determine seed weight of seed lot for selected species.<br>115. Perform seed vigour test.<br>116. Evaluate seed viability at different RH/ temperature | Plant reproduction and seed development; seed anatomy and morphology.<br>Significance of seed quality<br>Process of seed germination<br>Effects of seed moisture on seed quality<br>Effect of drying temperature and duration on seed germination<br>Drying methods - importance and factors affecting<br>Seeds-methods of propagation, selection of seeds, quality of seed |

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| | | levels and packaging materials.<br>117. Practice seed drying methods.<br>118. Practice seed packaging viz. moisture pervious, moisture impervious and moisture resistant etc.<br>119. Prepare seed analysis report. | |
| Professional Skill 42 Hrs;<br><br>Professional Knowledge 12 Hrs | Perform crop cultivation, soil and irrigation water management. | 120. Practice field preparation, make plots, ridges and raised beds.<br>121. Transplant paddy to develop Nursery.<br>122. Incorporate crop with green manuring.<br>123. Determine field capacity by field method.<br>124. Determine water requirement for irrigation.<br>125. Demonstrate furrow method of irrigation.<br>126. Demonstrate check basin and basin method of irrigation.<br>127. Erect and perform operation of sprinkler irrigation system.<br>128. Determine irrigation water use efficiency. | Nursery raising techniques, Methods of transplanting Climate and environment effect on plant growth. Sowing/planting times and methods, Intercultural operations, physiological disorders, harvesting, cool and warm season vegetables. Importance of water in crop production. Water requirement of crops and factors affecting it. Quantity and quality of irrigation water. Systems and methods of irrigation; drip, sprinkler and mist Irrigation etc. |
| Professional Skill 63 Hrs;<br><br>Professional Knowledge 18 Hrs | Identify plant diseases and implement integrated pests management. | 129. Identify various plant diseases and their symptom.<br>130. Practice control measures of crop diseases for following crops: Rice, sorghum, wheat, bajra maize, sugarcane, turmeric | Introduction, important plant pathogenic organisms, different groups, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, viruses, viriods, algae, protozoa and phanerogamic parasites with examples of disease |

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| | | tobacco, groundnut, castor sunflower, sesame, cotton, red gram, greengram, blackgram, Bengal gram and beans etc.<br>131. Visit nearby farm for control measures of crop diseases. | caused by them.<br><br>Economic importance, symptoms, cause, epidemiology, disease cycle and integrated management of various diseases. |
| | | 132. 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.<br>133. Predict the times when the pest pressure is most severe in different crops.<br>134. Practice on suitable integrated pests management techniques:<br>a) Cultural control<br>b) Mechanical control<br>c) Sanitary control<br>d) Natural control<br>e) Biological control<br>f) Hot plant resistance<br>g) Use of pesticides, herbicides<br>135. Practice integrated pests management in Rabi crops.<br>136. Practice integrated pests management in Kharif crops. | Damage from insect/pests to major field crops.<br>Regional forecast of the timing of activity of different pests.<br><br>Integrated pests management techniques. |
| Professional Skill 42 Hrs;<br><br>Professional Knowledge 12 Hrs | Perform application of fertilizers for various crops. | 137. Identify various inorganic fertilizers.<br>138. Practice application of fertilizer by different methods. Knowledge of mixing fertilizers with other | Composts-Different methods, Mechanical compost plants, Vermin composting, Green manures, oil cakes, sewage and sludge-Biogas plant slurry, plant and animal refuges, |

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| | | fertilizers and amendments.<br>a) Deep soil placement method<br>b) Broadcasting<br>c) Banding<br>d) Foliar application and norms for combining fertilizers with other agrochemicals<br>139. Practice application of fertilizers through irrigation water (fertigation).<br>140. Practice on preparation of compost from organic waste.<br>141. Practice use of primary fertilizers (N-P-K) in crops.<br>142. Practice using secondary fertilizers (N, P, K, Ca, Mg, S) in crops.<br>143. Practice optimum use of fertilizers in crops.<br>144. Practice safe methods of fertilizer storage and handling. | 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. |
| Professional Skill 84 Hrs;<br><br>Professional Knowledge 24 Hrs | Perform crop cultivation, soil and irrigation water management. | 145. Identify Kharif crops and their seeds.<br>146. Identify field implements.<br>147. Calculate fertilizer doses for kharif crops.<br>148. Practice cultivation of pigeon pea, moong bean, urd bean, groundnut, sesame, soybean etc.<br>149. Identify Kharif season weeds.<br>150. Practice cultivation of Kharif crops viz. Rice, maize, sorghum, pear millet, minor | Classification of crops Kharif crops; Soil and climatic requirement, improved varieties, cultivation practices, yield and economic importance of rice, maize, sorghum, pear millet, minor millets. System of rice intensification (SRI) Weeds-characteristics, losses caused by weeds, dissemination, competition and methods of control. Different straw management |

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| | | millets etc.<br>151. Examine the maturity of crops and estimate the yields.<br>152. Practices of different sowing methods in combine harvested fields.<br>153. Practice operation of Paddy straw management machinery. | machines and uses of paddy straw. |
| | | 154. Identify different Rabi crops and their seeds.<br>155. Identify weeds of Rabi crops and perennial weeds.<br>156. Practice seed bed preparation and sowing of wheat, maize, sugarcane and sunflower.<br>157. Determine seed rate for Rabi crops (wheat and mustard).<br>158. Determine fertilizer doses for Rabi crops.<br>159. Identify weeds in wheat and grain legumes.<br>160. Practice planting of beet and potato.<br>161. Analyze quality of sugarcane.<br>162. Estimate yield of rabi crops.<br>163. Examine the maturity stage of different Rabi crops.<br>164. Practice agronomic traits for Rabi crops.<br>165. Practice threshing, and drying, winnowing and safe storage of produce.<br>166. Determine moisture content of grains. | Classification of crops; *Rabi* crops.<br>Soil and climatic requirement, improved varieties, cultivation practices, yield and economic importance of Wheat, barley, chickpea, lentil, peas, rapeseed and mustard etc.<br>Cropping system, Crop rotation, Multiple Cropping, Mixed Cropping and Intercropping.<br><br>Economic importance of forage crops, berseem, shaftal, lucerne, oats, ryegrass, senji.<br>Hay and silage making.<br><br>Crop residue management, benefits and different methods.<br><br>Different methods of threshing of rabi crops, Threshers and Combines.<br>Storage of grains. |

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| Professional Skill 21 Hrs;<br><br>Professional Knowledge 06 Hrs | Perform organic farming, soil, vermin compost & pests management. | 167. Prepare and use compost by food waste.<br>168. Prepare and use green manure.<br>169. Practice use of drip irrigation for vegetable plants.<br>170. Practice use of vermin compost and residual waste in crops.<br>171. Practice use of bio-control agents and bio pesticides for pests management. | The principal methods of organic farming include crop rotation, green manures and compost, biological pest control, and mechanical cultivation.<br>Organic certification in brief.<br><br>Green house technology / low cost greenhouses / utility of green houses. |
| Professional Skill 22 Hrs;<br><br>Professional Knowledge 06 Hrs | Recommend optimal use of water, quantum & interval at which watering to be done in crop production and micro irrigation. | 172. Undertake economical use of water and perform related activities for regeneration of ground water.<br>173. Water harvesting and recommend quantum and interval at which watering is to be done for crop production.<br>174. Undertake suitable water saving techniques for sustainable water conservation.<br>175. Undertake precision water harvesting and carry out micro-irrigation.<br>176. Carry out different modern techniques for saving and preservation of water. | Importance of rainwater harvesting.<br>Precision water harvesting<br>Water harvesting techniques<br>Percolation pit |
| Professional Skill 21 Hrs;<br><br>Professional Knowledge 06 Hrs | Prepare report on various aspects of farming. | 177. Prepare a report for setting a net /poly houses.<br>178. Plan and prepare a report to establish soil testing laboratory.<br>179. Plan and prepare a report to | Definitions, meaning and Role of agricultural marketing.<br>Scope of agricultural marketing, Process of agricultural marketing Role of government in agricultural |

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| | | setup a nursery.<br>180. Plan and prepare a report to setup agriculture product marketing.<br>181. Prepare a report for waste management and produce organic manure. | marketing.<br>Food corporation of India, Quality control of agricultural products, AGMARK, contract farming. |
| **Project work / Industrial visit**<br>**Broad Areas:**<br>a) Organic farming<br>b) Water harvesting<br>c) Pests management<br>d) Seed management | | | |

| SYLLABUS FOR CORE SKILLS |
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| 1. Employability Skills (Common for all trades) (120 hrs) |

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in/dgt.gov.in

| List of Tools & Equipment | | | |
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| **SOIL TESTING AND CROP TECHNICIAN (For batch of 24 Candidates)** | | | |
| **S No.** | **Name of the Tools and Equipment** | **Specification** | **Quantity** |
| **A. TRAINEES TOOL KIT** (For each additional unit trainees tool kit Sl. 1-6 is required additionally) | | | |
| 1. | Apron | | (24+1)Nos. |
| 2. | Spade | | (24+1)Nos. |
| 3. | Sickle | | (24+1)Nos. |
| 4. | Khurpa | | (24+1)Nos. |
| 5. | Kasola | | (24+1)Nos. |
| 6. | Trifali | | (24+1)Nos. |
| **B. SHOP TOOLS & EQUIPMENT** | | | |
| **(i) Tools, instruments and lab apparatus** | | | |
| 7. | Measuring tape | | 04 Nos. |
| 8. | Zindra | | 07 Nos. |
| 9. | Dori (Nylon rope) | | 10 Nos. |
| 10. | Wheel hand hoe | | 07 Nos. |
| 11. | pH meter | | 02 Nos. |
| 12. | Electrical conductivity meter | | 02 Nos. |
| 13. | Flame photometer | | 1 No. |
| 14. | Spectrophotometer | | 1 No. |
| 15. | Atomic absorption spectrophotometer | | 1 No. |
| 16. | Shaking apparatus | | 1 No. |
| 17. | Distillation unit | Quartz | 1 No. |
| 18. | Ammonia distillation unit (with heaters) | | 1 No. |
| 19. | Sieves | | 12 Nos. |
| 20. | Four digit weighing balance | | 02 Nos. |
| 21. | Ordinary physical balance | | 02 Nos. |
| 22. | Gas connection | | 1 No. |
| 23. | Sampling tools (augers) | | 07 Nos. |
| 24. | Refrigerator (165 Ltr) | | 1 No. |
| 25. | Gas cylinders with regulators | a) LPG<br>b) Acetylene<br>c) Nitrous Oxide | 02 Each |
| 26. | Incubator (with temperature control) | | 1 No. |

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| 27. | Infrared soil moisture estimation unit | | 1 No. |
| 28. | Electric oven | With fan and temperature regulation | 1 No. |
| 29. | Soil cores | Designed for Bulk density determination | 1 No. |
| 30. | Soil infiltrator meter | | 1 No. |
| 31. | GPS system with mobile phone | | 02 Nos. |
| 32. | Tabletop centrifuge | | 1 No. |
| 33. | Auto Titrater | | 1 No. |
| **(ii) List of Equipment** | | | |
| 34. | Temperature controlled horizontal Shaker | With clamps to hold 150 ml conical flasks | 02 Nos. |
| 35. | Hot plates | (3' x 2') | 1 No. |
| 36. | Wooden roller | | 02 Nos. |
| 37. | Wooden Trays with racks | | 1 No. |
| 38. | Cabinets | To store soil samples till complete soil analysis | 1 No. |
| 39. | Soil mixer | | 1 No. |
| 40. | Seed cum fertilizer drill | | 1 No. |
| 41. | Manual seed drill | | 1 No. |
| 42. | Manual multi crop planter | | 1 No. |
| 43. | Paddy transplanter | | 1 No. |
| 44. | Bed planter | | 1 No. |
| 45. | Ridger | | 1 No. |
| 46. | Tractor | | 1 No. |
| 47. | Cultivator | | 1 No. |
| 48. | Disc harrow | | 1 No. |
| 49. | Planker | | 1 No. |
| 50. | Knapsack sprayer | | 02 Nos. |
| 51. | Vertical conveyor reaper | | 1 No. |
| 52. | Multi crop Thresher | | 1 No. |
| 53. | Soil testing laboratory | | 01 |
| 54. | Field for raising crops | | 1 acre (minimum) |
| **D. LIST OF CONSUMABLES** | | | |
| 55. | Seeds | different Rabi and Kharifcrops | As per requirement |
| 56. | Fertilizers | Urea, DAP, SSP, MOP | -do- |
| 57. | Spraying chemicals | | -do- |

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| 58. | Soil and water test report cards | | 100 Nos. |
| 59. | Chemicals for soil testing lab | | As per list |
| 60. | Glassware for soil testing lab | | As per list |
| **E. SHOP FLOOR FURNITURE AND MATERIALS** - | | | |
| 61. | Computer Chair | | 1+1 Nos. |
| 62. | Computer Table | | 1+1 Nos. |
| 63. | Desktop computer and related MS office software | CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch.) Licensed Operating System and Antivirus compatible with trade related software. | 1+1 Nos. |
| 64. | Fire Extinguishers | Arrange all proper NOCs and equipment from Municipal/Competent authorities. | |
| 65. | Internet connection | with all accessories | As required |
| 66. | Laser printer | | 1 No. |
| 67. | LCD projector/ LED/LCD TV/ Interactive Smart Board | 42” | 1 No. |
| 68. | Stools | | 25 (24+1)Nos. |
| 69. | Suitable classroom furniture | | As required |
| 70. | Suitable Worktables with vices | | As required |
| 71. | Trainees locker 6½ ‘ x 3’ x 1½’ | To accommodate 20 Lockers | 2 Nos. |
| 72. | Plastic tubs / Buckets | | 04 Nos. |

***NOTE:***

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

## ANNEXURE -II

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

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

| **List of Expert Members contributed/ participated for finalizing the course curriculum of Soil Testing and Crop Technician on 17.05.2017 at Deepak Fertilizers, Pune.** | | | |
|---|---|---|---|
| **S No.** | **Name & Designation Sh/Mr./Ms.** | **Organization** | **Remarks** |
| 1. | Sanjay Kumar,<br>Joint Director of Training | CSTARI - Kolkata | Coordinator |
| 2. | Bharat K. Nigam,<br>Training Officer | CSTARI - Kolkata | Coordinator |
| 3. | Dr. P. C. Srivastava<br>Prof. and Head | G.B. Pant University of Ag and Tech., Pantnagar | Expert |
| 4. | Dr. B. C. Sharma<br>Prof. and Head | Sher-eKashmir University of Ag Sc. & Tech., Jammu | Expert |
| 5. | Dr. M. Mahadevappa<br>Director (Rural Development) | JSSMVP Mysore | Expert |
| 6. | S. K. Chaudhari<br>ADG (SWM) NRM Division, KAB-II | ICAR, New Delhi | Expert |
| 7. | Dr Mahesh Kumar Narang<br>Agriculture Engineer | Dept. of FM&PE, PAU, Ludhiana | Expert |
| 8. | Dr Meharban Singh Kahlon<br>Asstt. Soil Physicst | Dept. of Soil Science, PAU, Ludhiana | Expert |
| 9. | Dr Amandeep Singh Brar<br>Asstt. Extension Specialist (Agronomy) | Dept. of Agronomy, PAU, Ludhiana | Expert |
| 10. | Shri Sanjiv Kumar<br>Vocational Instructor | ATI, Gill Road, Ludhiana | Expert |
| 11. | Dr. P. Sen,<br>Addl. Director (Retd.) | Agriculture Directorate, Kolkata | Expert |
| 12. | R.N. Bandyopadhyaya,<br>OSD | PBSDM, West Bengal | Expert |
| 13. | L. K. Mukherjee,<br>DDT | CSTARI, Kolkata | Member |
| 14. | Nirmalya Nath,<br>ADT | CSTARI, Kolkata | Member |

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| 15. | Vijayrao B. Patil,<br>Vice President | Deepak fertilizers, Pune | Member |
| 16. | Birajdar Sanjay N.,<br>DGM | Deepak fertilizers, Pune | Member |
| 17. | Sanjay M. Jagtap,<br>DGM | Deepak fertilizers, Pune | Member |
| 18. | Dnyanesh B. Bande,<br>Sr. Manager | Deepak fertilizers, Pune | Member |
| 19. | Satish R. Nartam,<br>DGM | Deepak fertilizers, Pune | Member |
| 20. | Uday Patil,<br>Sr. Manager | Deepak fertilizers, Pune | Member |
| 21. | MakrandMeher,<br>Manager | Deepak fertilizers, Pune | Member |
| 22. | S.N. Mankar,<br>DGM | Deepak fertilizers, Pune | Member |
| 23. | Jalinder C. Godse,<br>Sr. Manager | Deepak fertilizers, Pune | Member |
| 24. | Akshaykumar B. Jambhulkar<br>Sr. Manager | Deepak fertilizers, Pune | Member |
| 25. | N.M. Kajale,<br>Principal | Govt. ITI Velhe, Maharastra | Member |

## ABBREVIATIONS

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


कौशलं बलम्