

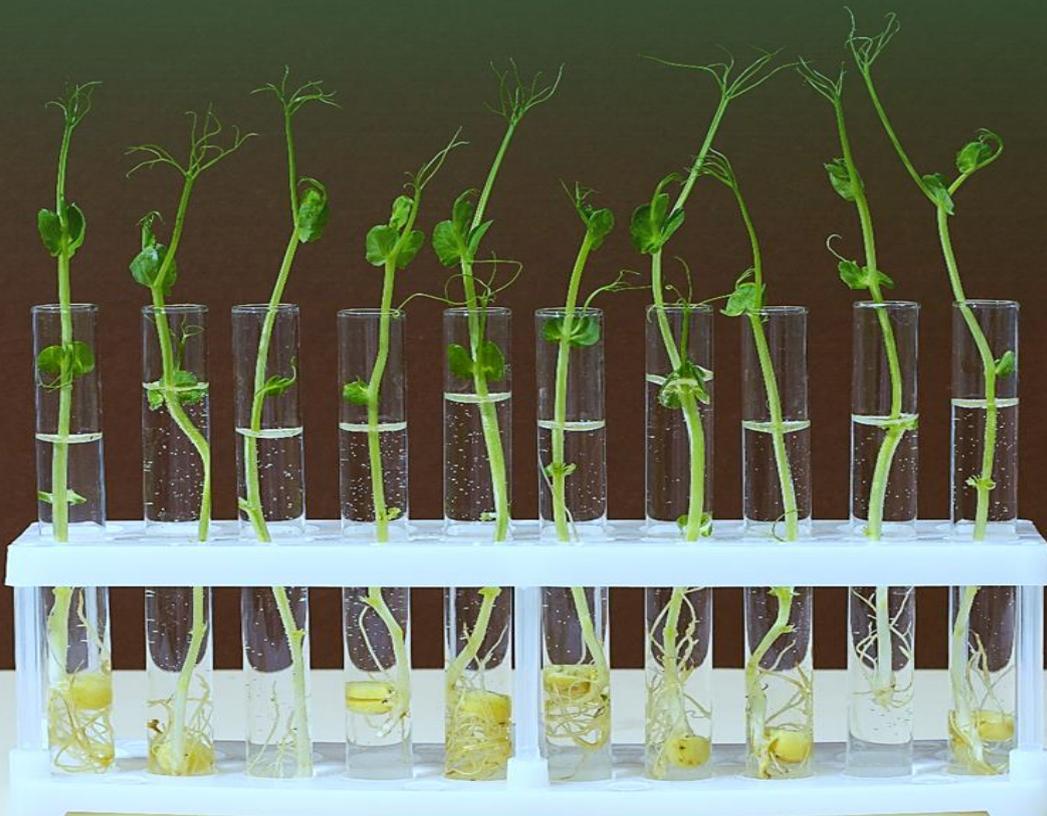
LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: PLANT TISSUE CULTURE TECHNICIAN

(QUALIFICATION PACK: Ref. Id. AGR/ Q8101)

SECTOR: AGRICULTURE

Grades 11 and 12



विद्यया ऽ मृतमश्नुते



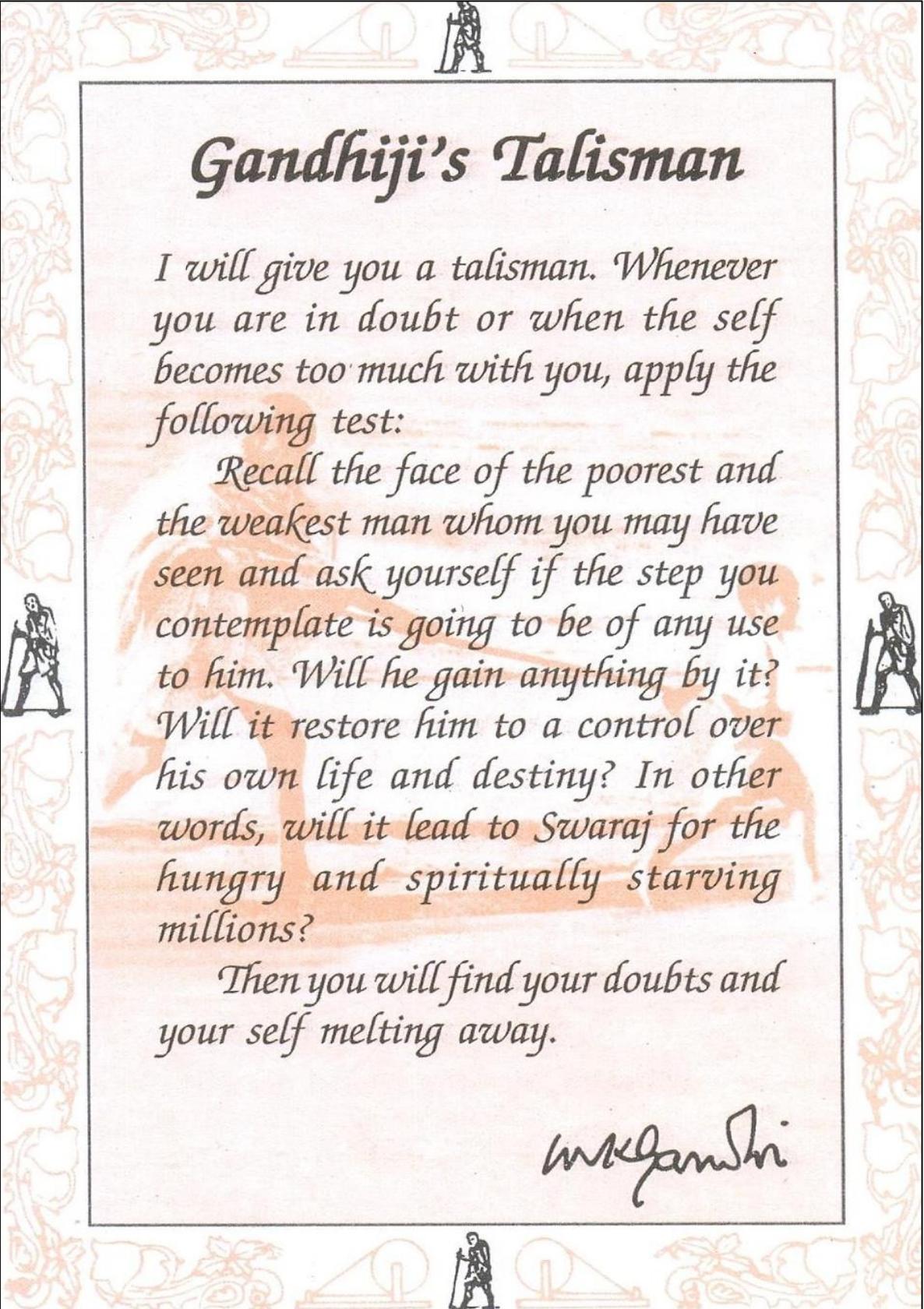
एन सी ई आर टी
NCERT

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

(a constituent unit of NCERT, under MoE, Government of India)

Shyamla Hills, Bhopal- 462 002, M.P., India

<http://www.psscive.ac.in>



Gandhiji's Talisman

I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test:

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to Swaraj for the hungry and spiritually starving millions?

Then you will find your doubts and your self melting away.

M.K. Gandhi

LEARNING OUTCOMES BASED VOCATIONAL CURRICULUM

JOB ROLE: PLANT TISSUE CULTURE TECHNICIAN
(QUALIFICATION PACK: Ref. Id. AGR/Q8101)

SECTOR: AGRICULTURE

Grades 11 and 12

विद्यया ऽ मृतमश्नुते



एन सी ई आर टी
NCERT

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
Shyamla Hills, Bhopal- 462 002, M.P., India

**LEARNING OUTCOME BASED VOCATIONAL
CURRICULUM**

Plant Tissue Culture Technician

December, 2023

© PSSCIVE, 2023

<http://www.psscive.ac.in>

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being used by the purchaser of the work.

The views and opinions expressed in this publication are those of the contributors/authors and do not necessarily reflect the views and policies of PSS Central Institute of Vocational Education, Bhopal. The PSSCIVE does not guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use.

Published by:

Joint Director
PSS Central Institute of Vocational
Education, NCERT, Shyamla Hills,
Bhopal



PATRON

Dr. Deepak Paliwal
Joint Director

*PSS Central Institute of Vocational Education
Bhopal*

COURSE COORDINATOR

Dr. Rajiv Kumar Pathak
*Professor & Head
Dept. of Agriculture & Animal Husbandry
PSS Central Institute of Vocational Education
Bhopal*

FOREWORD

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent of the National Council of Educational Research and Training (NCERT) is spearheading the efforts of developing learning outcome-based curricula and courseware aimed at integrating both vocational and general education to open pathways of career progression for students. The curriculum has been developed for the vocational education programme introduced under the Centrally Sponsored Scheme of Samagra Shiksha of the Ministry of Education (erstwhile, Ministry of Human Resource Development) and is aligned to the National Skill Qualifications Framework (NSQF). The curricula for vocational courses are being developed under the project approved by the Project Approval Board (PAB) of 'Samagra Shiksha', which is an overarching programme for the school education sector extending from pre-school to Grade 12.

It is a matter of great pleasure to introduce this learning outcome-based curriculum as part of the vocational training package for the job role of Plant Tissue Culture. The curriculum has been developed for the secondary students of Grades 11 and 12 and is aligned to the National Occupation Standards (NOSs) for the job role. The curriculum aims to provide children with employability and vocational skills to support occupational mobility and lifelong learning. It will help them to acquire specific occupational skills that meet employers' immediate skill needs. The teaching-learning is to be done through interactive sessions in classrooms, practical activities in laboratories or workshops, projects, field visits, etc. and professional experience is to be provided through on-the-job training.

The curriculum has been developed and reviewed by a group of experts and their contributions are duly acknowledged. The utility of the curriculum will be adjudged by the qualitative improvement that it brings about in teaching-learning. The feedback and suggestions on the content by the teachers and other stakeholders will be of immense value to us in bringing about further improvement in this document.

DINESH PRASAD SAKLANI
Director

National Council of Education Research and Training

PREFACE

India today stands poised at a very exciting juncture in its saga. The potential for achieving inclusive growth is immense and the possibilities are equally exciting. The world is looking at us to deliver sustainable growth and progress. To meet the growing expectations, India will largely depend upon its young workforce. In order to fulfil the growing aspirations of our youth and the demand for a skilled human resource, the Ministry of Education (erstwhile, Ministry of Human Resource Development (MHRD)), Government of India introduced the revised Centrally Sponsored Scheme of Vocationalisation of School Education that aims to provide for the diversification of educational opportunities so as to enhance individual employability, reduce the mismatch between demand and supply of skilled manpower and provide an alternative for those pursuing higher education. For spearheading the scheme, the PSS Central Institute of Vocational Education (PSSCIVE) was entrusted with the responsibility to develop learning outcome- based curricula, student textbooks and e-learning material for job roles in various sectors.

The PSSCIVE firmly believes that the vocationalisation of education in the nation needs to be established on a strong footing of philosophical, cultural and sociological traditions and it should aptly address the needs and aspirations of the students besides meeting the skill demands of the industry. The curriculum, therefore, aims at developing the desired professional, managerial and communication skills to fulfil the needs of society and the world of work. In order to honour its commitment to the nation, the PSSCIVE is developing learning outcome- based curricula with the involvement of faculty members and leading experts in the field. It is being done through the concerted efforts of leading academicians, professionals, policymakers, partner institutions, Vocational Education and Training (VET) experts, industry representatives, and teachers. The expert group, through a series of consultations, working group meetings and use of reference materials develops a national curriculum. We extend our gratitude to all the contributors for selflessly sharing their precious knowledge, acclaimed expertise, and valuable time and positively responding to our request for development of curriculum.

The success of this curriculum depends upon its effective implementation, and it is expected that the managers of vocational education programme, vocational educators, vocational teachers/ trainers, and other stakeholders will make earnest efforts to provide better facilities, develop linkages with the industry or world of work and foster a conducive learning environment for the students for effectively transacting the curriculum and to achieve the learning outcomes as per the content of the curriculum document.

DEEPAK PALIWAL

Joint Director

PSS Central Institute of Vocational Education

ACKNOWLEDGEMENTS

On behalf of the team at the PSS Central Institute of Vocational Education (PSSCIVE) we are grateful to the members of the Project Approval Board (PAB) of *Samagra Shiksha* and the officials of the Ministry of Education (MoE), Government of India for the financial support to the project for development of curricula.

We are grateful to the Director, National Council for Education, Research and Training (NCERT) for his support and guidance. We also acknowledge the contributions of our colleagues at the Technical Support Group of *Samagra Shiksha*, Ministry of Education (MoE), National Skill Development Agency (NSDA) and National Skill Development Corporation (NSDC) and Agriculture Skill Council of India (ASCI) for their academic support and cooperation in the development of curricula.

We are grateful to contributors and reviewers for their earnest effort and contributions in the development of this learning outcome-based curriculum. Their names are acknowledged in the list of contributors and reviewers.

We are also grateful to Dr. Rajiv Pathak, Course Coordinator, Department of Agriculture and Animal Husbandry, PSSCIVE, Bhopal for his contributions.

The contributions made by Dr. Vinay Swarup Mehrotra, Professor, Department of Agriculture and Animal Husbandry and Curriculum Development and Evaluation Centre (CDEC), Dr. Vipin Kumar Jain, Associate Professor, Department of Humanities, Science, Education and Research and Dr. Dipak D. Shudhalwar, Professor, Department of Engineering and Technology, PSSCIVE in development of the curriculum for the employability skills are duly acknowledged.

The suggestions and editorial support provided by Dr. Mukur Ganguly, Dr. Ankita Sharma, Mr. Aman Kumar and Ms. Pooja Sharma, Assistant Professors (Contractual), Department of Agriculture and Animal Husbandry, PSSCIVE, Bhopal is duly acknowledged.

PSSCIVE Team

CONTENTS

S. No.	Title	Page No.		
	Foreword	i		
	Preface	ii		
	Acknowledgement	iii		
1.	Course Overview	1		
2.	Scheme of Units and Assessment	2		
3.	Teaching/Training Activities	3		
4.	Certification	4		
5.	Unit Content	CLASS 11		
		Part A	Employability Skills	
			Unit 1: Communication Skills – I	7
			Unit 2: Self-management Skills – I	9
			Unit 3: Information and Communication Technology Skills – I	10
			Unit 4: Entrepreneurial Skills – I	11
			Unit 5: Green Skills – I	12
		Part B	Vocational Skills	
			Unit 1: Introduction to plant tissue culture	13
			Unit 2: Laboratory setup and Equipment for Plant Tissue Culture	13
			Unit 3: Preparation and Storage of Culture Media for Plant Tissue Culture	14
			Unit 4: Maintenance of Aseptic Conditions in a Plant Tissue Culture Laboratory	15
			CLASS 12	
		Part A	Employability Skills	
			Unit 1: Communication Skills – II'	16
			Unit 2: Self-management Skills – II	16
			Unit 3: Information and Communication Technology Skills – II	17
			Unit 4: Entrepreneurial Skills – II	19
			Unit 5: Green Skills – II	20
		Part B	Vocational Skills	
	Unit 1: Preparation of mother plant and explant for Plant Tissue Culture	21		
	Unit 2: Inoculating the explant and its multiplication	22		
	Unit 3: Acclimatizing the tissue cultured plants	22		
	Unit 4: Resource optimization and methods of recycling and disposing waste	23		
	Unit 5: Hygiene, cleanliness, safety and emergency procedures at workplace	23		
6.	Organisation of Field Visits	24		
7.	List of Equipment and Materials	24		
8.	Vocational Teacher's/Trainer's Qualification and Guidelines	25		
9.	List of references	27		
10.	List of Contributors	28		
11.	List of Reviewers	28		

1. COURSE OVERVIEW

COURSE TITLE: AGRICULTURE – PLANT TISSUE CULTURE TECHNICIAN

A Plant Tissue Culture Technician is responsible for preparing culture media, labeling tubes/specimen containers, inoculating, sub culturing, incubating tissue cultures, hardening plants, maintaining laboratory supplies, cleaning of laboratory equipment utilizing proper cleaning protocols and procedures and maintaining records, under limited supervision. The individual must be physically fit to work for long durations. The person must have attention to detail, problem-solving skills with the ability to work collaboratively with others to achieve the work objectives.

COURSE OUTCOMES: On completion of the course, students should be able to:

- Apply effective oral and written communication skills to interact with people;
- Demonstrate the basic skills of using computer;
- Demonstrate self-management skills;
- Demonstrate the ability to provide a self-analysis of entrepreneurial skills and abilities;
- Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
- Describe the process of preparing the lab and relevant lab equipment for plant tissue culture
- Demonstrate the process of carrying out plant tissue culture under a controlled conditions in a lab
- Demonstrate the process of transplanting the tissue cultured plants
- Explain the importance of maintaining the record of various operations carried out during plant tissue culture
- Explain the importance of following various inclusive practices for all genders and persons with disabilities (PWD) at work
- Demonstrate various practices to maintain personal hygiene, cleanliness and safety at work

COURSE REQUIREMENTS: The learner should have the basic knowledge of science.

COURSE LEVEL: On completion of this course, a student can take up a higher-level course for a job role in plant tissue culture sector.

COURSE DURATION: 600 hrs

Class 11 : 300 hrs

Class12 : 300 hrs

Total : 600 hrs

2. SCHEME OF UNITS AND ASSESSMENT

This course is a planned sequence of instructions consisting of Units meant for developing employability and vocational competencies of students of Class 11 and 12 opting for vocational subject along with general education subjects. The unit-wise distribution of hours and marks for Class 11 is as follows:

The unit-wise distribution of hours and marks for Class 11 is as follows:

GRADE 11			
Units		No. of Hours for Theory and Practical =300	Max. Marks for Theory and Practical = 100
Part A	Employability Skills		
	Unit 1: Communication Skills	25	02
	Unit 2: Self-management Skills	25	02
	Unit 3: Information and Communication Technology Skills	20	02
	Unit 4: Entrepreneurial Skills	25	02
	Unit 5: Green Skills	15	02
	Total	110	10
Part B	Vocational Skills		
	Unit 1: Introduction to plant tissue culture	30	40
	Unit 2: Laboratory setup and Equipment for Plant Tissue Culture	45	
	Unit 3: Preparation and Storage of Culture Media for Plant Tissue Culture	50	
	Unit 4: Maintenance of Aseptic Conditions in a Plant Tissue Culture Laboratory	40	
	Total	165	40
Part C	Practical Work		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	10	35
Part D	Project Work/Field Visit		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	15	15
	Grand Total	300	100

The unit-wise distribution of hours and marks for Class 12 is as follows:

GRADE 12			
Units		No. of Hours for Theory and Practical =200	Max. Marks for Theory and Practical = 100
Part A	Employability Skills		
	Unit 1: Communication Skills	25	02
	Unit 2: Self-management Skills	25	02
	Unit 3: Information and Communication Technology Skills	20	02
	Unit 4: Entrepreneurial Skills	25	02
	Unit 5: Green Skills	15	02
	Total	110	10
Part B	Vocational Skills		
	Unit 1: Preparation of mother plant and explant for Plant Tissue Culture	45	40
	Unit 2: Inoculating the explant and its multiplication	40	
	Unit 3: Acclimatizing the tissue cultured plants	30	
	Unit 4: Resource optimization and methods of recycling and disposing waste	15	
	Unit 5: Hygiene, cleanliness, safety and emergency procedures at workplace	35	
	Total	165	40
Part C	Practical Work		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	10	35
Part D	Project Work/Field Visit		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	15	15
	Grand Total	300	100

3. TEACHING/TRAINING ACTIVITIES

The teaching and training activities have to be conducted in classroom, laboratory/ workshops and field visits. Students should be taken to field visits for interaction with experts and to expose them to the various tools, equipment, materials, procedures and operations in the workplace. Special emphasis should be laid on the occupational safety, health and hygiene during the training and field visits.

CLASSROOM ACTIVITIES

Classroom activities are an integral part of this course and interactive lecture sessions, followed by discussions should be conducted by trained vocational teachers. Vocational teachers should make effective use of a variety of instructional aids, such as audio-video materials, colour slides, charts, diagrams, models, exhibits, hand-outs, online teaching materials, etc. to transmit knowledge and impart training to the students.

PRACTICAL WORK IN LABORATORY/WORKSHOP

Practical work may include but not limited to hands-on-training, simulated training, role play, case-based studies, exercises, etc. Equipment and supplies should be provided to enhance hands-on learning experience of students. Only trained personnel should teach specialized techniques. A training plan that reflects tools, equipment, materials, skills and activities to be performed by the students should be submitted by the vocational teacher to the Head of the Institution.

FIELD VISITS/ EDUCATIONAL TOUR

In field visits, children will go outside the classroom to obtain specific information from experts or to make observations of the activities. A checklist of observations to be made by the students during the field visits should be developed by the Vocational Teachers for systematic collection of information by the students on the various aspects. Principals and Teachers should identify the different opportunities for field visits within a short distance from the school and make necessary arrangements for the visits. At least three field visits should be conducted in a year.

4. ASSESMENT AND CERTIFICATION

Upon successful completion of the course by the candidate, the Central/ State Examination Board for Secondary Education and the respective Sector Skill Council will certify the competencies.

The National Skills Qualifications Framework (NSQF) is based on outcomes referenced to the National Occupation Standards (NOSs), rather than inputs. The NSQF level descriptors, which are the learning outcomes for each level, include the process, professional knowledge, professional skills, core skills and responsibility. The assessment is to be undertaken to verify that individuals have the knowledge and skills needed to perform a particular job and that the learning programme undertaken has delivered education at a given standard. It should be closely linked to certification so that the individual and the employer could come to know the competencies acquired through the vocational subject or course. The assessment should be reliable, valid, flexible, convenient, cost effective and above all it should be fair and transparent. Standardized assessment tools should be used for assessment of knowledge of students. Necessary arrangements should be made for using technology in assessment of students.

KNOWLEDGE ASSESSMENT (THEORY)

Knowledge Assessment will include two components: one comprising of internal assessment and second component is external examination including theory and practical examinations to be conducted by the Board. The assessment tools shall contain components for testing the knowledge and application of knowledge. The knowledge test can be objective paper-based test or short structured questions based on content of the curriculum.

Written Test allows candidates to demonstrate that they have the knowledge and understanding of a given topic. Question paper for the vocational subject may be prepared by the subject experts comprising group of experts of academicians, experts from existing vocational subject experts/teachers, subject experts from university/colleges or industry recommended by the respective Sector Skill Council. The Central/State Examination Board will use the services of the relevant experts for setting up the question papers and conducting the

examinations.

The blue print for the question paper may be as follows:

Duration:3 hrs;

Max. Mark: 40

	Typology of Question	No. of Questions			Marks
		Very Short Answer (1 mark)	Short Answer (2 Marks)	Long Answer (3 Marks)	
1.	Remembering – (Knowledge based simple recall questions, to know specific facts, terms, concepts, principles, or theories; identify, define or recite, information)	3	2	2	13
2.	Understanding – (Comprehension – to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	2	3	2	14
3.	Application – (Use abstract information in concrete situation, to apply knowledge to new situations: Use given content to interpret a situation, provide an example, or solve a problem)	0	2	1	07
4.	High Order Thinking Skills – (Analysis & Synthesis – Classify, compare, contrast, or differentiate between different pieces of information; Organize and/ or integrate unique pieces of information from a variety of sources)	0	2	0	04
5.	Evaluation – (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	0	1	0	02
	Total	5x1=3	10x2=20	5x3=15	40 (20 questions)

SKILL ASSESSMENT (PRACTICAL)

Assessment of skills by the students should be done by the assessors/examiners on the basis of practical demonstration of skills by the candidate, using a competency checklist. The competency checklist should be developed as per the National Occupation Standards (NOSs) given in the Qualification Pack for the Job Role to bring about necessary consistency in the quality of assessment across different sectors and Institutions. The student has to demonstrate competency against the performance criteria defined in the National Occupation Standards and the assessment will indicate that they are 'competent', or are 'not yet competent'. The assessors assessing the skills of the students should possess a current experience in the industry and should have undergone an effective training in assessment principles and practices. The Sector Skill Councils should ensure that the assessors are provided with the training on the assessment of competencies.

Practical examination allows candidates to demonstrate that they have the knowledge and understanding of performing a task. This will include hands-on practical exam and viva voce. For practical, there should be a team of two evaluators – the subject teacher and the expert from the relevant industry certified by the Board or concerned Sector Skill Council. The same team of examiners will conduct the viva voce. Viva voce allows candidates to demonstrate communication skills and content knowledge.

Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits. The number of external examiners would be decided as per the existing norms of the Board and these norms should be suitably adopted/adapted as per the specific requirements of the vocational subject. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits.

Audio or video recording can be done at the time of viva voce. The number of external examiners would be decided as per the existing norms of the Board and these norms should be suitably adopted/adapted as per the specific requirements of the vocational subject.

Project Work (individual or group projects) are a great way to assess the practical skills on a certain time period or timeline. Project work should be given on the basis of the capability of the individual to perform the tasks or activities involved in the project. Projects should be discussed in the class and the teacher should periodically monitor the progress of the project and provide feedback for improvement and innovation.

Field visits should be organised as part of the project work. Field visits can be followed by a small-group work/project work. When the class returns from the field visit, each group might be asked to use the information that they have gathered to prepare presentations or reports of their observations. Project work should be assessed on the basis of practical file or student portfolio.

Student Portfolio is a compilation of documents that supports the candidate's claim of competence. Documents may include reports, articles, photos of products prepared by students in relation to the unit of competency.

5. UNIT CONTENTS

GRADE 11

Part A: Employability Skills

S. No.	Units	Duration (hrs)
1.	Communication Skills- III	25
2.	Self-management Skills – III	25
3.	Information and Communication Technology Skills - III	20
4.	Entrepreneurial Skills – III	25
5.	Green Skills – III	15
	Total	110

UNIT 1: COMMUNICATION SKILLS – III			
Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Demonstrate knowledge of communication	1. Introduction to communication process 2. Importance of communication 3. Elements of communication 4. Perspectives in communication 5. Effective communication	1. Role play on the communication process 2. Group discussion on the importance of communication and factors affecting perspectives in communication 3. Charts preparation on elements of communication 4. Classroom discussion on the 7Cs (i.e. Clear, Concise, Concrete, Correct, Coherent, Courteous and Complete) for effective communication	03
2. Demonstrate verbal communication	1. Verbal communication 2. Public Speaking	1. Role-play of a phone conversation. 2. Group activity on delivering a speech and practicing public speaking	02
3. Demonstrate non-verbal communication	1. Importance of non-verbal communication 2. Types of non-verbal communication 3. Visual communication	1. Role-play on non-verbal communication 2. Group exercise and discussion on Do's and Don'ts to avoid body language mistakes 3. Group activity on methods of communication	02
4. Demonstrate speech using correct pronunciation	1. Pronunciation basics 2. Speaking properly 3. Phonetics 4. Types of sounds	1. Group activities on practicing pronunciation	01
i. Apply an assertive communication style	1. Important communication styles 2. Assertive communication 3. Advantages of assertive communication 4. Practicing assertive communication	1. Group discussion on communication styles 2. Group discussion on observing and sharing communication styles	03

ii. Demonstrate the knowledge of saying no	1. Steps for saying 'No' 2. Connecting words	1. Group discussion on how to say 'No'	02
iii. Identify and use parts of speech in writing	1. Capitalisation 2. Punctuation 3. Basic parts of speech 4. Supporting parts of speech	1. Group activity on identifying parts of speech 2. Writing a paragraph with punctuation marks 3. Group activity on constructing sentences 4. Group activity on identifying parts of speech	03
iv. Write correct sentences and paragraphs	1. Parts of a sentence 2. Types of objects 3. Types of sentences 4. Paragraph	1. Activity on framing sentences 2. Activity on active and passive voice 3. Assignment on writing different types of sentences	02
v. Communicate with people	1. Greetings 2. Introducing self and others	1. Role-play on formal and informal greetings 2. Role-play on introducing someone 3. Practice and group discussion on how to greet different people?	02
vi. Introduce yourself to others and write about oneself	1. Talking about self 2. Filling a form	1. Practicing self-introduction and filling up forms 2. Practicing self-introduction to others	01
vii. Develop questioning skill	1. Main types of questions 2. Forming closed and open-ended questions	1. Practice exercise on forming questions 2. Group activity on framing questions	01
viii. Communicate information about family to others	1. Names of relatives 2. Relations	1. Practice talking about family 2. Role-play on talking about family members.	01
ix. Describe habits and routines	1. Concept of habits and routines	1. Group discussion on habits and routines 2. Group activity on describing routines	01
x. Ask or give directions to others	1. Asking for directions 2. Using landmarks	1. Role-play on asking and giving directions 2. Identifying symbols used for giving directions	01
Total			25

UNIT 2: SELF-MANAGEMENT-III			
Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Identify and analyse own strengths and weaknesses	<ol style="list-style-type: none"> 1. Understanding self 2. Techniques for identifying strengths and weaknesses 3. Difference between interests and abilities 	<ol style="list-style-type: none"> 1. Activity on writing aims in life 2. Preparing a worksheet on interests and abilities 	03
2. Demonstrate personal grooming skills	<ol style="list-style-type: none"> 1. Guidelines for dressing and grooming 2. Preparing a personal grooming checklist 	<ol style="list-style-type: none"> 1. Role-play on dressing and grooming standards 2. Self-reflection activity on various aspects of personal grooming 	04
3. Maintaining personal hygiene	<ol style="list-style-type: none"> 1. Importance of personal hygiene 2. Three steps to personal hygiene 3. Essential steps of hand washing 	<ol style="list-style-type: none"> 1. Role-play on personal hygiene 2. Assignment on personal hygiene 	03
4. Demonstrate the knowledge of working in a team and participating in group activities	<ol style="list-style-type: none"> 1. Describe the benefits of teamwork 2. Working in a team 	<ol style="list-style-type: none"> 1. Assignment on working in a team 2. Self-reflection on teamwork 	03
5. Develop networking skills	<ol style="list-style-type: none"> 1. Benefits of networking skills 2. Steps to build networking skills 	<ol style="list-style-type: none"> 1. Group activity on networking in action 2. Assignment on networking skills 	03
6. Describe the meaning and importance of self-motivation	<ol style="list-style-type: none"> 1. Meaning of self-motivation 2. Types of motivation 3. Steps to building self-motivation 	<ol style="list-style-type: none"> 1. Activity on staying motivated 2. Assignment on reasons hindering motivation 	03
7. Set goals	<ol style="list-style-type: none"> 1. Meaning of goals and purpose of goal-setting 2. Setting SMART goals 	<ol style="list-style-type: none"> 1. Assignment on setting SMART goals 2. Activity on developing long-term and short-term goals using SMART method 	03
8. Apply time management strategies and techniques	<ol style="list-style-type: none"> 1. Meaning and importance of time management 2. Steps for effective time management 	<ol style="list-style-type: none"> 1. Preparing a checklist of daily activities 	03
Total			25

UNIT 3: INFORMATION AND COMMUNICATION TECHNOLOGY-III			
Learning Outcome	Theory (08 hrs)	Practical (12 hrs)	Duration (20 hrs)
1. Create a document on the word processor	<ol style="list-style-type: none"> 1. Introduction to ICT 2. Advantages of using a word processor. 3. Work with Libre Office Writer 	<ol style="list-style-type: none"> 1. Demonstration and practice of the following: <ul style="list-style-type: none"> • Creating a new document • Typing text • Saving the text • Opening and saving file on Microsoft Word/Libre Office Writer. 	02
2. Identify icons on the toolbar	<ol style="list-style-type: none"> 1. Status bar 2. Menu bar 3. Icons on the Menu bar 4. Multiple ways to perform a function 	<ol style="list-style-type: none"> 1. Group activity on using basic user interface of LibreOffice writer 2. Group activity on working with Microsoft Word 	02
3. Save, close, open and print document	<ol style="list-style-type: none"> 1. Save a word document 2. Close a word document 3. Open an existing document 4. Print 	<ol style="list-style-type: none"> 1. Group activity on performing the functions for saving, closing and printing documents in LibreOffice Writer 2. Group activity on performing the functions for saving, closing and printing documents in Microsoft Word 	02
4. Format text in a word document	<ol style="list-style-type: none"> 1. Change style and size of text 2. Align text 3. Cut, Copy, Paste 4. Find and replace 	<ol style="list-style-type: none"> 1. Group activity on formatting text in LibreOffice Writer 2. Group activity on formatting text in Microsoft Word 	02
5. Check spelling and grammar in a word document	<ol style="list-style-type: none"> 1. Use of spell checker 2. Autocorrect 	<ol style="list-style-type: none"> 1. Group activity on checking spellings and grammar using LibreOffice Writer 2. Group activity on checking spellings and grammar using Microsoft Word 	02
6. Insert lists, tables, pictures, and shapes in a word document	<ol style="list-style-type: none"> 1. Insert bullet list 2. Number list 3. Tables 4. Pictures 5. Shapes 	<ol style="list-style-type: none"> 1. Practical exercise of inserting lists and tables using LibreOffice Writer 	03

7. Insert header, footer and page number in a word document	1. Insert header 2. Insert footer 3. Insert page number 4. Page count	1. Practical exercise of inserting header, footer and page numbers in LibreOffice Writer 2. Practical exercise of inserting header, footer and page numbers in Microsoft Word	03
8. Make changes by using the track change option in a word document	1. Tracking option 2. Manage option 3. Compare documents	1. Group activity on performing track changes in LibreOffice Writer 2. Group activity on performing track changes in Microsoft Word	04
Total			20

UNIT 4: ENTREPRENEURIAL SKILLS – III

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Differentiate between different kinds of businesses	1. Introduction to entrepreneurship 2. Types of business activities	1. Role-play on different kinds of businesses around us	03
2. Describe the significance of entrepreneurial values	1. Meaning of value 2. Values of an Entrepreneur 3. Case study on qualities of an entrepreneur	1. Role-play on qualities of an entrepreneur	03
3. Demonstrate the attitudinal changes required to become an entrepreneur	1. Difference between the attitude of entrepreneur and employee	1. Interviewing employees and entrepreneurs	03
4. Develop thinking skills like an entrepreneur	1. Problems of entrepreneurs 2. Problem-solving 3. Ways to think like an entrepreneur	1. Group activity on identifying and solving problems	04
5. Generate business ideas	1. The business cycle 2. Principles of idea creation 3. Generating a business idea 4. Case studies	1. Brainstorming on generating a business ideas	04
6. Describe customer needs and the importance of	1. Understanding customer needs 2. Conducting a	1. Group activity to conduct a customer survey	04

conducting a customer survey	customer survey		
7. Create a business plan	<ol style="list-style-type: none"> 1. Importance of business planning 2. Preparing a business plan 3. Principles to follow for growing a business 4. Case studies 	<ol style="list-style-type: none"> 1. Group activity on developing a business plan 	04
Total			25

UNIT 5: GREEN SKILLS – III

Learning Outcome	Theory (07 hrs)	Practical (08 hrs)	Duration (15 hrs)
1. Describe the importance of the main sector of the green economy	<ol style="list-style-type: none"> 1. Meaning of ecosystem, food chain and sustainable development 2. Main sectors of the green economy- E-waste management, green transportation, renewal energy, green construction, and water management 	<ol style="list-style-type: none"> 1. Group discussion on sectors of green economy 2. Poster making on various sectors for promoting green economy 	06
2. Describe the main recommendations of policies for the green economy	<ol style="list-style-type: none"> 1. Policies for a green economy 	<ol style="list-style-type: none"> 1. Group discussion on initiatives for promoting the green economy 2. Writing an essay or a short note on the important initiatives for promoting green economy. 	03
3. Describe the major green sectors/ areas and the role of various stakeholders in the green economy	<ol style="list-style-type: none"> 1. Stakeholders in the green economy 	<ol style="list-style-type: none"> 1. Group discussion on the role of stakeholders in the green economy 2. Making solar bulbs. 	03
4. Identify the role of government and private agencies in the green economy	<ol style="list-style-type: none"> 1. Role of the government in promoting a green economy 2. Role of private agencies in promoting green economy 	<ol style="list-style-type: none"> 1. Group discussion on the role of Government and Private Agencies in promoting a green economy. 2. Poster making on green sectors. 	03

Total	15
--------------	-----------

Part B–Vocational Skills

S. No.	Units	Duration (Hrs)
1.	Introduction to plant tissue culture	30
2.	Laboratory setup and Equipment for Plant Tissue Culture	45
3.	Preparation and Storage of Culture Media for Plant Tissue Culture	50
4.	Maintenance of Aseptic Conditions in a Plant Tissue Culture Laboratory	40
	Total	165

Unit 1: Introduction to Plant Tissue Culture

Learning Outcome	Theory (12 Hrs)	Practical (18 Hrs)	Duration (30 Hrs)
1. Explain plant tissue culture techniques and its importance	1. Define plant tissue culture 2. Basics and principles of Plant Tissue culture 3. Application of different Plant tissue culture techniques in plant propagation 4. Automation in Plant Tissue culture 5. Economic importance of plant tissue culture in India	1. Identify and enlist commonly propagated plants by Plant Tissue Culture Technique 2. Visit a nearby Plant tissue culture laboratory, observe and note down different techniques	15
2. Explain the scope and prospect of plant tissue culture In India	1. Scope and employment opportunities of plant tissue culture technician in India 2. Present and future of Plant tissue culture Industry in India	1. Enlist the employment opportunity in plant tissue culture	15
Total			30

Unit 2: Laboratory setup and Equipment for Plant Tissue Culture

Learning Outcome	Theory (20 hrs)	Practical (25 hrs)	Duration (45 hrs)
------------------	-----------------	--------------------	-------------------

1. Demonstrate the process of Laboratory setup and equipment for plant tissue culture.	<ol style="list-style-type: none"> 1.Explain different components of plant tissue culture laboratory 2.Preparation of common reagents used in a plant tissue culture lab 3. Equipment and glassware used in a plant tissue culture lab and their maintenance 	<ol style="list-style-type: none"> 1.Go to a nearby plant tissue culture lab and observe and prepare a note on arrangement of chemicals and equipment 2.Enlist the common chemicals used in a plant tissue culture lab 	23
2. Demonstrate the process of sterilization, cleaning/washing and disinfection of glassware and equipment in plant tissue culture lab	<ol style="list-style-type: none"> 1. Explain the importance of sterilisation of lab and lab equipment. 2. Describe the process of cleaning/washing and disinfection of glassware and equipment. 3. Describe the process of disposing waste chemicals and solutions safely. 	<ol style="list-style-type: none"> 1. Demonstration of sterilization techniques 2. Demonstrate the process of filtration, sterilisation of the stock solutions through a syntax filter. 3. Visit plant tissue culture lab and observe cleaning/washing and disinfection of glassware and equipments. 	22
Total			45 hrs

Unit 3: Preparation and Storage of Culture Media for Plant Tissue Culture

Learning Outcome	Theory (20 hrs)	Practical (30 hrs)	Duration (50 Hrs)
1. Different types of culture medium used in plant tissue culture	<ol style="list-style-type: none"> 1. Various types of tissue culture nutrient medium <ol style="list-style-type: none"> a) Multiplication medium b) Rooting medium 	<ol style="list-style-type: none"> 1. Prepare MS (Murashige & Skoog) culture medium for growth promotion 	15
2. Demonstrate the process of preparation of medium for different plant tissue culture techniques.	<ol style="list-style-type: none"> 1. General methodology for media preparation in plant tissue culture lab <ol style="list-style-type: none"> a) Preparation of stock solutions, vitamin and growth regulators. b) Calculation of Normality and Molarity 	<ol style="list-style-type: none"> 1. Prepare a solution of given strength (Normality & Molarity, Parts per million) 	25

3. Explain the process of adjusting the plant tissue culture medium's Potential of Hydrogen (pH)	<ol style="list-style-type: none"> Preparation of buffers and solutions Measurement of pH and EC 	<ol style="list-style-type: none"> Measure the pH of different solutions and write in your notebook if they are acidic, basic or neutral <ol style="list-style-type: none"> Prepare buffer solution of given strength 	10
Total			50

Unit 4: Maintenance of Aseptic Conditions in a Plant Tissue Culture Laboratory

Learning Outcome	Theory (15 hrs)	Practical (25 hrs)	Duration (40 Hrs)
1. Demonstrate the process of sterilization and storing the culture medium.	<ol style="list-style-type: none"> Describe sterilization methods and storage of culture medium 	<ol style="list-style-type: none"> Demonstrate the process of sterilization of glassware Visit a nearby plant tissue culture lab and note the details of each chemical reagent used there 	16
2. Demonstrate the methods of Explant sterilisation	<ol style="list-style-type: none"> Explain the sterilization and disinfection of plant material in plant tissue culture 	<ol style="list-style-type: none"> Demonstrate sterilization and disinfection methods used for plant material Identify the chemicals used in sterilization process 	14
3. Demonstrate biosafety practices followed in a plant tissue culture lab	<ol style="list-style-type: none"> Describe the Good laboratory practices followed in a plant tissue culture lab 	<ol style="list-style-type: none"> Make a chart of Good laboratory practices that should be followed in a plant tissue culture lab and hang it in your classroom 	04
4. Demonstrate ways to ensure cleanliness around the workplace.	<ol style="list-style-type: none"> Explain the Need of health and hygiene at workplace Describe common health-related guidelines laid down by the organizations/ Government at the workplace. 	<ol style="list-style-type: none"> Demonstrate hygiene practices to be followed at the workplace. Demonstrate the correct way of washing hands using soap and water, and alcohol-based hand rubs. 	06
Total			40

GRADE 12

Part A: Employability Skills

S. No.	Units	Duration (hrs)
1.	Communication Skills- IV	25
2.	Self-management Skills - IV	25
3.	Information and Communication Technology Skills - IV	20
4.	Entrepreneurial Skills – IV	25
5.	Green Skills – IV	15
	Total	110

UNIT 1: COMMUNICATION SKILLS – IV			
Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Demonstrate active listening skills	1. Active listening -listening skill, stages of active listening 2. Overcoming barriers to active listening	1. Group discussion on factors affecting active listening 2. Poster making on steps for active listening 3. Role-play on negative effects of not listening actively	10
2. Identify the parts of speech	1. Parts of speech – using capitals, punctuation, basic parts of speech, Supporting parts of speech	1. Group practice on identifying parts of speech 2. Group practice on constructing sentences	10
3. Write sentences	1. Writing skills to practice the following: <ul style="list-style-type: none"> • Simple sentence • Complex sentence • Types of objects 2. Identify the types of sentences <ul style="list-style-type: none"> • Active and Passive sentences • Statement/ • Declarative sentence • Question/ • Interrogative sentence - Emotion/ Reaction or Exclamatory sentence - Order or Imperative sentence 3. Paragraph writing	1. Group activity on writing sentences and paragraphs 2. Group activity on practicing writing sentences in active or passive voice 3. Group activity on writing different types of sentences (i.e., declarative, exclamatory, interrogative and imperative)	05
Total			25

UNIT 2: SELF-MANAGEMENT SKILLS – IV

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Describe the various factors influencing motivation and positive attitude	<ol style="list-style-type: none"> 1. Motivation and positive attitude 2. Intrinsic and extrinsic motivation 3. Positive attitude – ways to maintain positive attitude 4. Stress and stress management - ways to manage stress 	<ol style="list-style-type: none"> 1. Role-play on avoiding stressful situations 2. Activity on listing negative situations and ways to turn it positive 	10
2. Describe how to become result oriented	<ol style="list-style-type: none"> 1. How to become result oriented? 2. Goal setting – examples of result-oriented goals 	<ol style="list-style-type: none"> 1. Group activity on listing aim in life 	05
3. Describe the importance of self-awareness and the basic personality traits, types and disorders	<ol style="list-style-type: none"> 1. Steps towards self-awareness 2. Personality and basic personality traits 3. Common personality disorders- <ul style="list-style-type: none"> • Suspicious • Emotional and impulsive • Anxious 4. Steps to overcome personality disorders 	<ol style="list-style-type: none"> 1. Group discussion on self-awareness 2. Group discussion on common personality disorders 3. Brainstorming steps to overcome personality disorder 	10
Total			25

UNIT 3: INFORMATION AND COMMUNICATION TECHNOLOGY SKILLS – IV

Learning Outcome	Theory (06 hrs)	Practical (14 hrs)	Duration (20 hrs)
1. Identify the components of a spreadsheet application	<ol style="list-style-type: none"> 1. Getting started with spreadsheet - types of a spreadsheet, steps to start LibreOffice Calc., components of a worksheet. 	<ol style="list-style-type: none"> 1. Group activity on identifying components of spreadsheet in LibreOffice Calc. 	02
2. Perform basic operations in a spreadsheet	<ol style="list-style-type: none"> 1. Opening workbook and entering data – types of data, steps to enter data, editing and deleting data in a cell 2. Selecting multiple cells 3. Saving the spreadsheet in various 	<ol style="list-style-type: none"> 1. Group activity on working with data on LibreOffice Calc. 	03

	<p>formats</p> <ol style="list-style-type: none"> Closing the spreadsheet Opening the spreadsheet. Printing the spreadsheet. 		
3. Demonstrate the knowledge of working with data and formatting text	<ol style="list-style-type: none"> Using a spreadsheet for addition – adding value directly, adding by using cell address, using a mouse to select values in a formula, using sum function, copying and moving formula Need to format cell and content Changing text style and font size Align text in a cell Highlight text 	<ol style="list-style-type: none"> Group activity on formatting a spreadsheet in LibreOffice Calc Group activity on performing basic calculations in LibreOffice Calc. 	02
4. Demonstrate the knowledge of using advanced features in spreadsheet	<ol style="list-style-type: none"> Sorting data Filtering data Protecting spreadsheet with password 	<ol style="list-style-type: none"> Group activity on sorting data in LibreOffice Calc 	03
5. Make use of the software used for making slide presentations	<ol style="list-style-type: none"> Presentation software available Steps to start LibreOffice Impress Adding text to a presentation 	<ol style="list-style-type: none"> Group practice on working with LibreOffice Impress tools 	02
6. Demonstrate the knowledge to open, close and save slide presentations	<ol style="list-style-type: none"> Open, Close, Save and Print a slide presentation 	<ol style="list-style-type: none"> Group activity on saving, closing and opening a presentation in LibreOffice Impress 	01
7. Demonstrate the operations related to slides and texts in the presentation	<ol style="list-style-type: none"> Working with slides and text in a presentation-adding slides to a presentation, deleting slides, adding and formatting text, highlighting text, aligning text, changing text colour 	<ol style="list-style-type: none"> Group activity on working with font styles in LibreOffice Impress 	04

8. Demonstrate the use of advanced features in a presentation	<ol style="list-style-type: none"> 1. Advanced features used in a presentation 2. Inserting shapes in the presentation 3. Inserting clipart and images in a presentation 4. Changing slide layout 	<ol style="list-style-type: none"> 1. Group activity on changing slide layout on LibreOffice Impress 	03
Total			20

UNIT 4: ENTREPRENEURIAL SKILLS-IV

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Describe the concept of entrepreneurship and the types and roles and functions entrepreneur	<ol style="list-style-type: none"> 1. Entrepreneurship and entrepreneur 2. Characteristics of entrepreneurship 3. Entrepreneurship-art and science 4. Qualities of a successful entrepreneur 5. Types of entrepreneurs 6. Roles and functions of an entrepreneur 7. What motivates an entrepreneur 8. Identifying opportunities and risk-taking 9. Startups 	<ol style="list-style-type: none"> 1. Group discussion on the topic "An entrepreneur is not born but created". 2. Conducting a classroom quiz on various aspects of entrepreneurship. 3. Chart preparation on types of entrepreneurs 4. Brainstorming activity on What motivates an entrepreneur 	10
2. Identify the barriers to entrepreneurship	<ol style="list-style-type: none"> 1. Barriers to entrepreneurship 2. Environmental barriers 3. No or faulty business plan 4. Personal barriers 	<ol style="list-style-type: none"> 1. Group discussion about "What we fear about entrepreneurship" 2. Activity on taking an interview of an entrepreneur. 	05
3. Identify the attitude that make an entrepreneur successful	<ol style="list-style-type: none"> 1. Entrepreneurial attitude 	<ol style="list-style-type: none"> 1. Group activity on identifying entrepreneurial attitude. 	05
4. Demonstrate the knowledge of entrepreneurial attitude and competencies	<ol style="list-style-type: none"> 1. Entrepreneurial competencies 2. Decisiveness 3. Initiative 4. Interpersonal skills- 	<ol style="list-style-type: none"> 1. Playing games, such as "Who am I". 2. Brainstorming a business idea 3. Group practice on "Best 	05

	positive attitude, stress management 5. Perseverance 6. Organizational skills - time management, goal setting, efficiency, managing quality.	out of Waste" 4. Group discussion on the topic of "Let's grow together" 5. Group activity on listing stress and methods to deal with it like Yoga, deep breathing exercises, etc. 6. Group activity on time management	
Total			25

UNIT 5: GREEN SKILLS-IV			
Learning Outcome	Theory (05 hrs)	Practical (10 hrs)	Duration (15 hrs)
1. Identify the benefits of the green jobs	1. Green jobs 2. Benefits of green jobs 3. Green jobs in different sectors: <ul style="list-style-type: none"> • Agriculture • Transportation • Water conservation • Solar and wind energy • Eco-tourism • Building and construction • Solid waste management • Appropriate technology 	1. Group discussion on the importance of green job. 2. Chart preparation on green jobs in different sectors.	08
2. State the importance of green jobs	1. Importance of green jobs in <ul style="list-style-type: none"> • Limiting greenhouse gas emissions • Minimizing waste and pollution • Protecting and restoring ecosystems • Adapting to the effects of climate change 	1. Preparing posters on green jobs. 2. Group activity on tree plantation. 3. Brainstorming different ways of minimizing waste and pollution	07

Total	15
--------------	-----------

Part B–Vocational Skills

S. No.	Units	Duration (Hrs)
1	Preparation of mother plant and explant for Plant Tissue Culture	45
2	Inoculating the explant and its multiplication	40
3	Acclimatizing the tissue cultured plants	30
4	Resource optimization and methods of recycling and disposing waste	15
5	Hygiene, cleanliness, safety and emergency procedures at workplace	35
Total		165

Unit 1: Preparation of mother plant and explant for Plant Tissue Culture			
Learning Outcome	Theory (18 hrs)	Practical (27 hrs)	Duration (45 hrs)
1. Select a mother plant	1. Criteria for Selecting mother plant	1. Go to a nearby plant tissue culture lab and observe the criteria used in selecting mother plants 2. Select mother plant as per criteria	10
2. Demonstrate the process of pre-treating the mother plant for explants	1. Describe pre-treatment of mother plants 2. Explain preparation of explants	1. Visit nearby plant tissue culture lab and observe the preparation of explants 2. Demonstrate the techniques for preparation of explants	15
3. Demonstrate the different plant tissue culture techniques	1. Describe plant tissue culture technique for clonal micropropagation 2. Describe plant tissue culture technique for somatic embryogenesis. 3. Describe plant tissue culture techniques for organogenesis.	1. Visit nearby plant tissue culture lab, observe and prepare a note on different plant tissue culture techniques being followed	20
Total			45

Unit 2: Inoculating the explant and its multiplication			
Learning Outcome	Theory (15 Hrs)	Practical (25 hrs)	Duration (40 hrs)
1. Demonstrate the process of excising explant from mother plant.	1. Explain the process of excising explant a) Surface sterilisation of explant	1. Demonstrate the process of explant preparation	10
2. Demonstrate the process of preparing and inoculating an explant to the culture medium	1. Describe the stages of Micropropagation a) Selection of explant 2. Establishment of aseptic culture	1. Demonstrate all the steps of explant inoculation	15
3. Multiplication and Rooting of propagule	1. Multiplication of explants 2. Rooting of regenerated shoots	1. Demonstrate all the steps of subculturing. 2. Demonstrate steps of rooting	15
Total			40

Unit 3: Acclimatizing the tissue cultured plants			
Learning Outcome	Theory (12 Hrs)	Practical (18 Hrs)	Duration (30 Hrs)
1. Demonstrate the process of acclimatization (Hardening)	1. Explain Purpose of acclimatization 2. Describe step by step primary and secondary method of acclimatization 3. Explain precautions taken during the acclimatization of cultured plants	1. Visit a nearby hardening unit and note the steps followed	15
2. List different types of crops viz., fruits, vegetables, ornamental and medicinal plants suitable for Tissue culture	1. Enlist different crops suitable for propagation by plant tissue culture	1. visit to tissue culture raised orchard	05

3. Demonstrate the method of transplanting the tissue cultured plants	<ol style="list-style-type: none"> 1. Explain Transplanting tissue cultured plants in open spaces and greenhouses 2. Describe the appropriate conditions for transplanting the acclimatized and established plants. 	1. Demonstrate the method of transplanting tissue cultured raised plant	10
Total			30

Unit 4: Resource optimization and methods of recycling and disposing waste

Learning Outcome	Theory (5 Hrs)	Practical (10 Hrs)	Duration (15 Hrs)
1. Demonstrate various practices for the effective use of resources and disposal of waste.	<ol style="list-style-type: none"> 1. Explain the benefits of resource optimization. 2. Describe the process of resource optimization in a plant tissue culture lab 3. Explain different methods of recycling and disposing waste. 	1. Demonstrate the process of recycling and disposing different types of waste	15
Total			15

Unit 5: Hygiene, cleanliness, safety and emergency procedures at workplace

Learning Outcome	Theory (15 hrs)	Practical (20 hrs)	Duration (35 Hrs)
1. Demonstrate First Aid, Treatment and Safety Equipment	<ol style="list-style-type: none"> 1. Describe common health and safety guidelines to be followed at the workplace 2. Chemical poisoning and first aid measures 3. Treatment for simple chemical poisoning 4. Safety and protective Equipment 5. Emergency response 6. Health and safety awareness at work place 	<ol style="list-style-type: none"> 1. Identification of the components of first aid kit 2. Identification of safety and protective devices 3. Demonstrate Use of safety and protective devices 	20

1. Safe use of lab equipment	<ol style="list-style-type: none"> 1. Checking the tools and lab equipment before use 2. Safety precautions taken during use of lab equipment 3. Daily/periodic mandatory inspections of lab equipment 4. Protective measures during operating lab equipment 	<ol style="list-style-type: none"> 1. Demonstration of general inspections for use of lab equipment 2. Demonstration of precautions taken during use of lab equipment 	15
Total			35

6. ORGANISATION OF FIELD VISITS

In a year, at least 3 field visits/educational tours should be organised for the students to expose them to the activities in the workplace.

Visit nearby Plant Tissue Culture Lab unit and observe the following: location, site, types of plant tissue culture techniques used, preparation of mother plant and explant, various culture media, infrastructure of the laboratory, equipment's and glassware used, acclimatization process, office building, store, green house, packing yard, seed bed, nursery bed, water tank, gate and fencing. During the visit, students should obtain the following information from the owner or the supervisor of the Plant tissue culture lab:

1. Scope and employment opportunities of plant tissue culture technician in India
2. Layout and requirements of a typical plant tissue culture laboratory
3. Application of different Plant tissue culture techniques in plant propagation
4. Equipment and glassware used in a plant tissue culture lab and their maintenance
5. Preparation of various culture media used in plant tissue culture
6. Preparation of mother plant and explant for plant tissue culture
7. Sterilization and disinfection of plant material in plant tissue culture lab
8. Acclimatizing the tissue cultured plants
9. Different types of plants/ crops suitable for propagation by plant tissue culture
10. Sterilization and disinfection of plant material in plant tissue culture lab
11. Number of plants grow annually
12. Quantity of produce sold annually
13. Sale procedure
14. Manpower engaged
15. Total expenditure in construction of Plant tissue culture lab
16. Total annual income
17. Profit/Loss (Annual)
18. Any other information

7. LIST OF EQUIPMENT AND MATERIALS

The list given below is suggestive and an exhaustive list should be prepared by the vocational teacher. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

1. Room for plant tissue culture lab
2. Growing chamber
3. pH meter

4. Transplanting trowel
5. Weighing balance (electronic)
6. Hot plate/stirrer
7. Refrigerator and freezer
8. Laminar flow transfer hood
9. Glassware/ Beakers
10. Wash bottles
11. Brushes
12. Culture tubes
13. Culture tube racks
14. Forceps
15. Sterilizers, autoclave
16. Glass pipettes
17. Graduated cylinders
18. Thermometers
19. Chlorine bleach (Sodium hypochlorite)
20. Lab markers
21. Gloves
22. Culture dishes
23. Cell culture vessels
24. Microscope
25. Vacuum Pump
26. Distillation Plant
27. Green house
28. Centrifuge
29. Incubator
30. Aspiration pump (peristaltic or vacuum)
31. Stocks of isopropyl alcohol

8. VOCATIONAL TEACHERS/ TRAINERS QUALIFICATION AND GUIDELINES

Qualification and other requirements for appointment of vocational teachers/trainers on contractual basis should be decided by the State/UT. The suggestive qualifications and minimum competencies for the vocational teacher should be as follows:

S. No.	Qualification	Minimum Competencies	Age Limit
1.	Post-graduation/ Diploma in Biotechnology from a recognized Institute/ University, with at least 1 year working/ Teaching experience	<ul style="list-style-type: none"> • Effective communication skills (oral and written) • Basic computing skills. 	18-37 years (as on Jan. 01 (year)) Age relaxation to be provided as per Govt. rules

Vocational Teachers/Trainers form the backbone of Vocational Education being imparted as an integral part of Samagra Shiksha. They are directly involved in teaching of vocational subjects and also serve as a link between the industry and the schools for arranging industry visits, On-the-Job Training (OJT) and placement.

These guidelines have been prepared with an aim to help and guide the States in engaging quality Vocational Teachers/Trainers in the schools. Various parameters that need to be looked into while engaging the Vocational Teachers/Trainers are mode and procedure of selection of Vocational Teachers/Trainers, Educational Qualifications, Industry Experience,

and Certification/Accreditation.

The State may engage Vocational Teachers/Trainers in schools approved under the component of Vocationalisation of Secondary and Higher Secondary Education under RMSA in the following ways:

- (i) Directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education (PSSCIVE), NCERT or the respective Sector Skill Council (SSC)

OR

- (ii) Through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

* *The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteria which the different organisations involved in education and training must meet in order to be accredited by competent bodies to provide government-funded education and training/skills activities. This is applicable to all organizations offering NSQF-compliant qualifications.*

The educational qualifications required for being a Vocational Teacher/Trainer for a particular job role are clearly mentioned in the curriculum for the particular NSQF compliant job role. The State should ensure that teachers / trainers deployed in the schools have relevant technical competencies for the NSQF qualification being delivered. The Vocational Teachers/Trainers preferably should be certified by the concerned Sector Skill Council for the particular Qualification Pack/Job role which he will be teaching. Copies of relevant certificates and/or record of experience of the teacher/trainer in the industry should be kept as record.

To ensure the quality of the Vocational Teachers/Trainers, the State should ensure that a standardized procedure for selection of Vocational Teachers/Trainers is followed. The selection procedure should consist of the following:

- (i) Written test for the technical/domain specific knowledge related to the sector;
- (ii) Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
- (iii) Practical test/mock test in classroom/workshop/laboratory.

In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP.

The State should ensure that the Vocational Teachers/Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools.

The State should ensure that the existing trainers undergo in-service training of 5 days every year to make them aware of the relevant and new techniques/approaches in their sector and understand the latest trends and policy reforms in vocational education.

The Head Master/Principal of the school where the scheme is being implemented should

facilitate and ensure that the Vocational Teachers/Trainers:

- (i) Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
- (ii) Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
- (iii) Make effective use of learning aids and ICT tools during the classroom sessions;
- (iv) Engage students in learning activities, which include a mix of different methodologies, such as project-based work, team work, practical and simulation-based learning experiences;
- (v) Work with the institution's management to organise skill demonstrations, site visits, on-job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
- (vi) Identify the weaknesses of students and assist them in upgradation of competency;
- (vii) Cater to different learning styles and level of ability of students;
- (viii) Assess the learning needs and abilities, when working with students with different abilities
- (ix) Identify any additional support the student may need and help to make special arrangements for that support;
- (x) Provide placement assistance

Assessment and evaluation of Vocational Teachers/Trainers is very critical for making them aware of their performance and for suggesting corrective actions. The States/UTs should ensure that the performance of the Vocational Teachers/Trainers is appraised annually. Performance based appraisal in relation to certain pre-established criteria and objectives should be done periodically to ensure the quality of the Vocational Teachers/Trainers. Following parameters may be considered during the appraisal process:

1. Participation in guidance and counselling activities conducted at Institutional, District and State level;
2. Adoption of innovative teaching and training methods;
3. Improvement in result of vocational students of Class X or Class XII;
4. Continuous upgradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
5. Membership of professional society at District, State, Regional, National and International level;
6. Development of teaching-learning materials in the subject area;
7. Efforts made in developing linkages with the Industry/Establishments;
8. Efforts made towards involving the local community in Vocational Education
9. Publication of papers in National and International Journals;
10. Organisation of activities for promotion of vocational subjects;
11. Involvement in placement of students /student support services.

9. LIST OF REFERENCE

- Kalyan Kumar De (2008). Plant Tissue Culture. New central Book Agency, Kolkata.
- Smith R.H. (1992). Plant tissue culture: techniques and experiments. Academic Press, San Diego

- Pareek A and Pareek L.K. (2013). Plant Tissue Culture Manual: Fundamentals and Applications in Biotechnology. Aavishkar Publishers and Distributors, Jaipur.
- Trigiano, R.N. (Ed.). (2000). Plant Tissue Culture Concepts and Laboratory Exercises (2nd ed.). Routledge. <https://doi.org/10.1201/9780203743133>

10. LIST OF CONTRIBUTORS

Sl. No. Name and address of expert

1. Dr. Rajiv Kumar Pathak, Professor and Head, Department of Agriculture and Animal Husbandry, PSSCIVE, NCERT, Shyamla Hills, Bhopal, Madhya Pradesh
2. Dr. Mukur Ganguly, Assistant Professor (Contractual), Department of Agriculture and Animal Husbandry, PSSCIVE, NCERT, Shyamla Hills, Bhopal, Madhya Pradesh
3. Dr. Ankita Sharma, Assistant Professor (Contractual), Department of Agriculture and Animal Husbandry, PSSCIVE, NCERT, Shyamla Hills, Bhopal, Madhya Pradesh
4. Mr. Aman Kumar, Assistant Professor (Contractual), Department of Agriculture and Animal Husbandry, PSSCIVE, NCERT, Shyamla Hills, Bhopal, Madhya Pradesh

11. LIST OF REVIEWERS

Sl. No. Name and address of expert

- 1 Dr. Maneesh Mishra, Principal Scientist, ICAR- Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh
- 2 Dr. (Mrs) Vinod Kataria, Associate Professor, Department of Botany, Jai Narain Vyas University, Jodhpur, Rajasthan
- 3 Dr. Ashok K. Patel, Assistant Professor, Department of Botany, Jai Narain Vyas University, Jodhpur, Rajasthan



PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
Shyamla Hills, Bhopal- 462 002, M.P., India