

LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: OPERATOR- PLASTIC 3D PRINTING
QUALIFICATION PACK: RSC/Q8009

SECTOR: RUBBER INDUSTRY
GRADE XI & XII



PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

(a constituent unit of NCERT, under Ministry of Education, Government of India)

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

<https://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

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**LEARNING OUTCOME-BASED VOCATIONAL
CURRICULUM
Rubber Industry -Operator-Plastic 3D Printing**

October, 2023

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

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Joint Director
PSS Central Institute of Vocational Education,
NCERT, Shyamla Hills,
Bhopal – 462 002, M.P., India



PATRONS

Dr. Dinesh Prasad Saklani,
Director,
National Council of Educational Research
& Training (NCERT),
New Delhi

Dr. Deepak Paliwal,
Joint Director
PSS Central Institute of Vocational Education,
Bhopal

COURSE COORDINATOR

Dr. Saurabh Prakash
Professor & Head
Department of Engineering & Technology
PSS Central Institute of Vocational Education,
Bhopal

FOREWORD

The Pandit Sundarlal 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 "Operator-Plastic 3D Printing". 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.

Prof. DINESH PRASAD SAKLANI
Director
National Council of Education Research & 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 fulfill the growing aspirations of our youth and the demand for a skilled human resource, the Ministry of Education, Government of India introduced the revised Centrally Sponsored Scheme of Vocationalisation of school education under *Samagra Shiksha*. 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 materials for the 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. In order to honour its commitment to the nation, the PSSCIE 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
Bhopal

ACKNOWLEDGEMENT

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 learning outcome-based curricula.

We are grateful to the Director, National Council of Educational Research and Training (NCERT) for his support and guidance. We also acknowledge the contributions of our colleagues at the NCERT, National Council for Vocational Education and Training (NCVET), National Skill Development Corporation (NSDC) and Rubber Chemical & Petrochemical Skill development Council (RCPSDC) for their academic support and cooperation.

We are grateful to Prof. Saurabh Prakash, Course Coordinator for his untiring efforts and contribution to the development of this learning outcome-based curriculum.

The contribution of the experts, Mr. Kiran Kumar Sahu, Mr. Neeraj Bhandari, Assistant professor in Department of Engineering & Technology (Contractual) are appreciated and acknowledged.

PSSCIVE Team

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1. COURSE OVERVIEW

COURSE TITLE: Operator –Plastic 3D Printing

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

- Describe the historical context and evolution of 3D Printers.
- Understand the basics of 3D printing and its applications.
- Describe the terminologies used in 3 D printing.
- Operate the hardware of 3D printer
- Apply proper procedure in performing plastic 3D printing operations.
- Employ suitable practices to communicate effectively with colleagues, and superiors to achieve a smooth workflow.
- Apply proper methods to identify 3D printing requirements
- Apply standard procedure to perform plastic 3D printing operations
- Employ suitable practices to ensure effective communication with colleagues, and superiors to achieve a smooth workflow
- Describe the health, hygiene, safety, and quality standards to be applicable as per the standards
- Apply proper practices to follow ethical and sustainable practices at the workplace
Apply effective oral and written communication skills to interact with people and customers.
- Identify the principal components of a computer system.
- Demonstrate the basic skills of using computer.
- Demonstrate self-management skills.
- Demonstrate the ability to provide a self-analysis in context of entrepreneurial skills and abilities.
- Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection.

COURSE REQUIREMENTS: The learner should be holding a 10th Grade pass certificate.

COURSE DURATION: 600 Hours

Grade 11	: 300 hours
Grade 12	: 300 hours

TOTAL	: 600 hours
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2. SCHEME OF UNITS

This course is a planned sequence of instructions consisting of units meant for developing employability and vocational competencies of students of grade 11 and 12 opting for vocational subject along with general education subjects.

The unit-wise distribution of hours and marks for Grade 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-III	25	
	Unit 2: Self-management Skills –III	25	
	Unit 3: Information and Communication Technology Skills-III	20	
	Unit 4: Entrepreneurial Skills-III	25	
	Unit 5: Green Skills-III	15	
	Total	110	
Part B	Vocational Skills		
	Unit 1: Introduction to Plastic Industry	20	
	Unit 2: Basics of 3D printing	40	
	Unit 3: 3D printing technologies	35	
	Unit 4: 3D printer and its installation	40	
	Unit 5: Maintenance of 3D printer	30	
	Total	165	
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 Grade 12 is as follows:

GRADE 12			
	Units	No. of Hours for Theory and Practical 300	Max. Marks for Theory and Practical 100
Part A	Employability Skills		
	Unit 1: Communication Skills-IV	25	
	Unit 2: Self-management Skills-IV	25	
	Unit 3: Information and Communication Technology Skills-IV	20	
	Unit 4: Entrepreneurial Skills-IV	25	
	Unit 5: Green Skills-IV	15	
	Total	110	

	Total	110	10
Part B	Vocational Skills		
	Unit 1: Selection of material for 3D printing	35	
	Unit 2: Operation of 3D Printing	50	
	Unit 3: 3D Printing Activities	40	
	Unit 4: Working effectively with others	30	
	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	200	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 aides, 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. ASSESSMENT AND CERTIFICATION

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, and 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 should include two components: one comprising of internal assessment and second an external examination, including theory examination 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 the content of the curriculum.

WRITTEN TEST

Written Test allows candidates to demonstrate that they have the knowledge and understanding of a given topic. Theory question paper for the vocational subject should be prepared by the subject experts comprising group of experts of academicians, experts from existing vocational subject experts/teachers, and subject experts from university/colleges or industry. The respective Sector Skill Council should be consulted by the Central/State Board for preparing the panel of experts for question paper setting 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 the meaning and to understand conceptually, interpret, compare, contrast, explain,	2	3	2	14

	paraphrase, or interpret information)				
3.	Application – (Use abstract information in a 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 and 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=5	10x2=20	5x3=15	40

SKILL ASSESSMENT (PRACTICAL)

Assessment of skills should be done by the assessors/examiners on the basis of practical demonstration of skills by students, 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 effective training in assessment principles and practices. The Sector Skill Councils should ensure that the assessors are provided with training on the assessment of competencies.

Practical examination allows students to demonstrate that they have the knowledge and understanding of performing a task. This will include a 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.

Project Work (individual or group project) is a great way to assess practical skills on a certain time period or timeline. Project should stimulate real-world scenarios, allowing students to solve problems or create curriculum's learning objectives, ensuring that student students are applying relevant concepts and skills Clear and detailed guidelines, including project activities, evaluation criteria, and deadlines should be provided by teachers/assessors. Rubrics, which should include aspects like content, creativity, organization, presentation and adherence to deadlines, should be used by the assessors to establish specific criteria for marking or grading.

Field visits can be followed by the submission of reports by the students based on checklist. Teachers will develop a detailed checklist of items or questions students need to address during the visit. This could include specific observations, data collection, interviews, etc. Teachers will assess the reports based on the completeness of checklist items, depth of observations, analysis, and overall presentation. After the visit, teachers will also encourage students to reflect on their field experience, for example what students learned, how they will apply the knowledge gained through the field visit, etc.

Student Portfolio is a compilation of documents that supports the candidate's claim of competence. Documents may include reports, articles and photos of products prepared by students in relation to the unit of competency. Copies of certificates and awards received for academic achievements, extracurricular activities, or competitions may also be included in the portfolio. Student's portfolio may also include personal reflections of the students on their learning journey, challenges faced, and lessons learned.

Viva Voce allows candidates to demonstrate communication skills and content knowledge. 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. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits.

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

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 the knowledge of communication	<ol style="list-style-type: none"> 1. Introduction to the communication process 2. Importance of communication 3. Elements of communication. 4. Perspectives in communication 5. Effective communication 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Verbal communication 2. Public Speaking 	<ol style="list-style-type: none"> 1. Role-play of a phone conversation. 2. Group activity on delivering a speech and practicing public speaking. 	02
3. Demonstrate non-verbal communication	<ol style="list-style-type: none"> 1. Importance of non-verbal communication 2. Types of non-verbal communication 3. Visual communication 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Pronunciation basics 2. Speaking properly 3. Phonetics 4. Types of sounds 	<ol style="list-style-type: none"> 1. Group activities on practicing pronunciation. 	01

5. Apply an assertive communication style	<ol style="list-style-type: none"> 1. Important communication styles 2. Assertive communication 3. Advantages of assertive communication 4. Practicing assertive communication 	<ol style="list-style-type: none"> 1. Group discussion on communication styles. 2. Group discussion on observing and sharing communication styles. 	03
6. Demonstrate the knowledge of saying no	<ol style="list-style-type: none"> 1. Steps for saying 'No' 2. Connecting words 	<ol style="list-style-type: none"> 1. Group discussion on how to say 'No'? 	02
7. Identify and use parts of speech in writing	<ol style="list-style-type: none"> 1. Capitalisation 2. Punctuation 3. Basic parts of speech 4. Supporting parts of speech 	<ol style="list-style-type: none"> 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
8. Write correct sentences and paragraphs	<ol style="list-style-type: none"> 1. Parts of a sentence 2. Types of object 3. Types of sentences 4. Paragraph 	<ol style="list-style-type: none"> 1. Activity on framing sentences. 2. Activity on active and passive voice. 3. Assignment on writing different types of sentences. 	02
9. Communicate with people	<ol style="list-style-type: none"> 1. Greetings 2. Introducing self and others 	<ol style="list-style-type: none"> 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
10. Introduce yourself to others and write about oneself	<ol style="list-style-type: none"> 1. Talking about self 2. Filling a form 	<ol style="list-style-type: none"> 1. Practicing self-introduction and filling up forms 2. Practicing self-introduction to others 	01
11. Develop questioning skill	<ol style="list-style-type: none"> 1. Main types of questions 2. Forming closed and open-ended questions 	<ol style="list-style-type: none"> 1. Practice exercise on forming questions . 2. Group activity on framing questions. 	01

12. 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
13. Describe habits and routines	1. Concept of habits and routines	1. Group discussion on habits and routines. 2. Group activity on describing routines.	01
14. 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 analyze own strengths and weaknesses	1. Understanding self 2. Techniques for identifying strengths and weaknesses 3. Difference between interests and abilities	1. Activity on writing aims in life. 2. Preparing a worksheet on interests and abilities.	03
2. Demonstrate personal grooming skills	1. Guidelines for dressing and grooming 2. Preparing a personal grooming checklist	1. Role-play on dressing and grooming standards. 2. Self-reflection activity on various aspects of personal grooming.	04
3. Maintaining personal hygiene	1. Importance of personal hygiene 2. Three steps to personal hygiene 3. Essential steps of hand washing	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	1. Describe the benefits of teamwork 2. Working in a team	1. Assignment on working in a team. 2. Self-reflection on teamwork.	03
5. Develop networking skills	1. Benefits of networking skills 2. Steps to build networking skills	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 a 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 	02

		for saving, closing and printing documents in Microsoft Word.	
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, and 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	<ol style="list-style-type: none"> 1. Insert header 2. Insert footer 3. Insert page number 4. Page count 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Tracking option 2. Manage option 3. Compare documents 	<ol style="list-style-type: none"> 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: ENTREPRENEURSHIP SKILLS – III			
Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Differentiate between different kinds of businesses	<ol style="list-style-type: none"> 1. Introduction to entrepreneurship 2. Types of business activities 	<ol style="list-style-type: none"> 1. Role-play on different kinds of businesses around us. 	03

2. Describe the significance of entrepreneurial values	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Difference between the attitude of entrepreneur and employee 	1. Interviewing employees and entrepreneurs.	03
4. Develop thinking skills like an entrepreneur	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The business cycle 2. Principles of idea creation 3. Generating a business idea 4. Case studies 	1. Brainstorming on generating business ideas.	04
6. Describe customer needs and the importance of conducting a customer survey	<ol style="list-style-type: none"> 1. Understanding customer needs 2. Conducting a customer survey 	1. Group activity to conduct a customer survey.	04
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 	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	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	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	1. Policies for a greeneconomy	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	1. Stakeholders in the green economy	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	1. Role of the government in promoting a green economy 2. Role of private agencies in promoting green economy	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 Plastic Industry	20
2.	Basics of 3D Printing	40
3.	3D Printing Technologies	35
4.	3D Printer and its Installation	40
5.	Maintenance of 3D printer	30
Total		165

Unit – 1 : Introduction to Plastic Industry			
Learning Outcome	Theory (10 Hrs)	Practical (10 Hrs)	Duration (20 Hrs)
1. Discuss the objectives and benefits of the Skill India Mission	<ol style="list-style-type: none"> 1. Introduction to Skill India Mission 2. Benefits of Skill India Mission 	-	3
2. Describe the scope of the Plastic Industry and its sub-sectors	<ol style="list-style-type: none"> 3. Impact Plastic Industry in today's economy 4. Sub sectors of Plastic Industries and its significance 	<ol style="list-style-type: none"> 1. Visit to a plastic Industry to understand the working of the industry. 	5
3. Describe various types and characteristics of plastic for making different products	<ol style="list-style-type: none"> 1. Understanding the chemical composition of the plastic 2. Characteristics of plastic for making different products. 	<ol style="list-style-type: none"> 1. Visit a plastic industry and understand the types of plastics manufactured. 2. Enlist the characteristics of each type of plastic and mention its usage. 	7
4. Discuss job role and opportunities for	<ol style="list-style-type: none"> 1. Job Role of Operator Plastic 3D Printing. 2. Opportunities for 	<ol style="list-style-type: none"> 1. Conduct a group discussion where students will discuss the role of operator 	3

Operator Plastic 3D printing in Plastic Manufacturing sector	Operator Plastic 3D Printing.	in 3D Printing Process.	
5. List the basic terminology used in Plastic Manufacturing sector	1. Explanation of the terminologies used in plastic manufacturing sector.	2. Conduct a group discussion in which students will discuss about the significance of 3D Printing in Plastic Industry.	2
Total			20
Unit – 2: Basics of 3D Printing			
Learning Outcome	Theory (25 Hrs)	Practical (15 Hrs)	Duration (40 Hrs)
1. Describe the origin (history) of 3D printing/Additive manufacturing	1. Introduction to 3D Printing 2. Historical content and evolution of 3D printing.	1. Visit a 3D printing lab to understand and observe the working of 3D printing plastic manufacturing.	5
2. Explain about the concept of 3D printing and its classification	1. Concept of 3D Printing (Additive Manufacturing) 2. Classification of 3D Printing on various parameters.		10
3. Describe the applications and significance of 3D Printing in 21 st Century	1. Various applications of 3D Printing in various sectors. 2. Need of 3D Printing in 21 st century.		05
4. Differentiate about Additive manufacturing and Computer Numerical Control (CNC)	1. Introduction to Computer Numerical Control (CNC) 2. Enlist the differences between Additive Manufacturing and CNC.	1. Visit a lab where CNC machine and 3D printing machine are in operation. Observe the differences between the two machines.	15

5. Differentiate between the Additive manufacturing and Traditional Manufacturing process in the field of rubber industry	1. Difference between 3D printing and traditional manufacturing process of various materials of plastic industry.	1. Visit the sites where the traditional manufacturing of plastic 3D objects is done. Enlist the differences between the two processes.	10
6. Basic software used for additive manufacturing for designing, slicing etc.	1. Name of the software used for various purposes in 3D printing.	1. Installation the different software used for 3D modeling. And slicing.	
Total			40
Unit – 3: 3 D Printing technologies			
Learning Outcome	Theory (20 Hrs)	Practical (15 Hrs)	Duration (35 Hrs)
1. Explain about different terminologies used in 3D Printing	1. Enlist and explain different terminologies used in 3D printing process.	1. Conduct live demonstration of 3D printer (Fused Deposition Modeling). Observe the process.	10
2. Describe various methods of 3D printing such as Fused Filament Fabrication (FFF), Stereo lithography (SLA), Selective Laser Sintering (SLA), Multi Jet Fusion (MJF)	1. Different methods of 3D printing and its procedure of operation.		15
3. Explain the method of 3D printing used in rubber industry	1. Elaborate specific method used in rubber industry for 3D Printing.		10
Total			35

Unit – 4: 3D Printer & its installation			
Learning Outcome	Theory (20 Hrs)	Practical (15 Hrs)	Duration (40 Hrs)
1. Explain the role and importance of 3D printer	1. Role and Importance of 3D printer	1. Illustrate steps to verify successful installation of printer	5
2. Identify different types of hardware and software used for additive manufacturing (3D printing)	1. Hardware requirements for installation of 3D printer. 2. Software requirements for installation of 3D printer.	2. Demonstrate the step-by-step process of installation of printer and resolve errors, if any.	15
3. List the workflow— Design, Model, Print— and procedures.	1. Procedure in operation of 3D printer.	3. Demonstrate taking test prints to check for print quality is as expected and take corrective action wherever required	10
4. List the types of defects on the 3Dprinter	1. Various defects in 3D printer and its operations. 2. Procedure of rectifying the defects observed in 3D printer and its operations such as Clogging in printer, wrapping in the process etc.		10
Total			40
Unit 5: Maintenance of 3D Printer			
Learning Outcome	Theory (20 Hrs)	Practical (15 Hrs)	Duration (30 Hrs)
1. Identify ways to perform periodic preventive maintenance as per instruction manual	1. Measures for maintenance of 3D printer as per mentioned in the manual instructions.	2. Demonstrate the use and process of performing preventive maintenance	5

2. List necessary precautions to be taken while performing periodic maintenance	1. Precautions to be taken while performing periodic maintenance.	3. Perform troubleshooting or contact technical support personnel in case of unresolved issues. 4. Perform regular up gradation of hardware and software as per company policy	5
3. State the standard operating procedures (SOPs) for printer settings, print jobs, filament material etc.	1. SOPs for various tasks such as printer settings, print jobs, filament material etc.		15
4. Describe the procedure of cleaning, lubrication, and maintenance of the 3D printing machines' and closing down the machine in line with the manufacturer's instructions	1. Significance of cleaning and lubrication of 3D printing machines		5
Total			30

GRADE XII

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 object 2. Identify the types of sentences <ul style="list-style-type: none"> • Active and Passive sentences • Statement/ Declarative sentence • Question/ Interrogative 	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,	05

	sentence - Emotion/ Reaction or Exclamatory sentence - Order or Imperative sentence - Paragraph writing	interrogative and imperative)	
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	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	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	1. How to become result oriented? 2. Goal setting – examples of result-oriented goals	1. Group activity on listing aim in life	05
3. Describe the importance of self-awareness and the basic personality traits, types and disorders	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	1. Group discussion on self-awareness 2. Group discussion on common personality disorders 3. Brainstorming steps to overcome personality disorder	10

Total	25
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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	1. Getting started with spreadsheet - types of a spreadsheet, steps to start LibreOffice Calc., components of a worksheet.	1. Group activity on identifying components of spreadsheet in LibreOffice Calc.	02
2. Perform basic operations in a spreadsheet	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 formats 4. Closing the spreadsheet 5. Opening the spreadsheet. 6. Printing the spreadsheet.	1. Group activity on working with data on LibreOffice Calc.	03
3. Demonstrate the knowledge of working with data and formatting text	1. 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 2. Need to format cell and content 3. Changing text style and font size 4. Align text in a cell 5. Highlight text	1. Group activity on formatting a spreadsheet in LibreOffice Calc 2. 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"> 1. Sorting data 2. Filtering data 3. Protecting spreadsheet with password 	1. 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"> 1. Presentation software available 2. Steps to start LibreOffice Impress 3. Adding text to a presentation 	1. 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"> 1. Open, Close, Save and Print a slide presentation 	1. 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"> 1. 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 	1. 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 	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	<ol style="list-style-type: none"> 1. Entrepreneurship and entrepreneur 2. Characteristics of entrepreneurship 	1. Group discussion on the topic "An entrepreneur is not born but created".	10

roles and functions entrepreneur	<ol style="list-style-type: none"> 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"> 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 	
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- positive attitude, stress management 5. Perseverance 6. Organisational skills- time management, goal setting, efficiency, managing quality. 	<ol style="list-style-type: none"> 1. Playing games, such as "Who am I". 2. Brainstorming a business ideas 3. Group practice on "Best 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 	05
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	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Group discussion on the importance of green job. 2. Chart preparation on green jobs in different sectors. 	08
3. State the importance of green jobs	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 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
1	Selection of Material for Fused deposition Modeling	35

2	3D Printing Operations	50
3	3D printing Activities	40
4	Working Effectively with others	30
Total		165

UNIT 1: SELECTION OF MATERIAL FOR FUSED DEPOSITION MODELING (FDM)			
Learning Outcome	Theory (05 hrs)	Practical (10 hrs)	Duration (15 hrs)
1. Describe the classification of material for FDM	1. Introduction to various materials used in FDM	1. Demonstrate the materials used for FDM method and observe its characteristics.	5
2. Explain the characteristics of material	1. Enlist the materials used in FDM 2. Characteristics of different materials used in FDM.		10
3. Explain the features of the plastics derived from renewable materials	1. Essential features of materials such as Polylactic Acid (PLA), ABS etc. 2. Types and characteristics of the material used for 3D printing including High Performance Polymers and Hybrid materials.	1. Show how to select material and model sample and validate tray and printing the sample model to check for appropriateness.	10
4. Describe the procedure to maintain the quality of	1. Different materials with their proper procedure to maintain the quality of	1. Demonstrate various materials and assign different materials to the students to encourage them to maintain the	10

materials during storage and handling	materials during storage and handling.	quality of materials during storage and handling.	
Total			35

UNIT 2: 3D PRINTING OPERATIONS			
Learning Outcome	Theory (25 hrs)	Practical (25 hrs)	Duration (50 hrs)
1. Identify the design, 3D models and the material before printing	<ol style="list-style-type: none"> 1. Procedure for identification of design of 3D model. 2. Procedure for identification of design of 3D printing material before printing. 	<ol style="list-style-type: none"> 1. Apply proper practices to confirm the 3D printing machine is appropriately set up as per job requirement 2. Show how to run the 3D printing machine safely and efficiently in line with the manufacturer's instructions and operate the machine at the required speed for the outputs required. 	10
2. Explain the operating procedure of 3D printing modeling	<ol style="list-style-type: none"> 1. Different software used for 3D modeling. 2. Step by Step procedure for 3D modeling. 3. Formats of file in accessible in 3d printing. 4. Error in STL files and methods to rectify and repair the same. 	<ol style="list-style-type: none"> 1. Create a sample 3D model of a keychain with your name. 	30
3. Explain the operating procedure of	<ol style="list-style-type: none"> 1. Introduction to slicing 2. Software used for slicing 	<ol style="list-style-type: none"> 1. Slice the keychain 3d model prepared using respective 2. slicing software. 	10

slicing	3. Step by step procedure for slicing.		
4. Explain optimizing parameters of printing such as layer thickness and operations. Temp range, orientation, gaping etc.	1. Methods to optimize printing operations		10
6. Explain the appropriate environment conditions for performing 3D printing operations	1. Appropriate conditions for performing 3D printing operations	1. Demonstrate how to remove completed objects from the machine at the appropriate time and sand, cut, snap off, or dissolve the structural supports 2. Employ proper inspection techniques to check the final quality of objects and take appropriate action to deal with any faults or blemishes	10
Total			70
UNIT 3: POST PROCESSING OPERATIONS			
Learning Outcome	Theory (15 hrs)	Practical (25 hrs)	Duration (40 hrs)
1. Explain the methods	1. Various methods of	1. Roleplay on	30

of performing post processing and finishing of 3D printed parts	<p>performing post processing.</p> <p>2. Finishing of 3Dprinted parts like sandblasting, polishing, spray paint, resin (Polylactic Acid (PLA)) dripping, etc. and taking necessary action to deal with any further post processing required.</p>	<p>how to report the status of work in the desired format as per the schedule to seniors and inform about any deviations or anomalies</p> <p>2. Demonstrate cleaning and lunrication of 3D printing machine</p>	
Total			30

UNIT 4: WORK EFFECTIVELY WITH OTHERS			
Learning Outcome	Theory (20 hrs)	Practical (10 hrs)	Duration (30hrs)
1. Explain the standard policies at workplace.	1. Standard policies on behavioral etiquette, professionalism and gender sensitive service practices at workplace and standard hierarchy and reporting structure	1. Role play on how interact with colleagues and seniors in a polite and professional manner, listen actively to the issues or requirements of colleagues and respond timely and appropriately	10
2. Discuss effective ways of team coordination	1. Role of team coordination at workplace.	1. Dramatize how to pass on essential information to the colleagues timely and coordinate with seniors on work-	10

		related and behavioural feedback.	
3. State the significance of listening, responding, trusting, supporting and respecting all colleagues and seniors	1. Significance of listening, responding, trusting, supporting and respecting all colleagues and seniors	(11) Roleplay on how to report the status of work in the desired format as per the schedule to seniors and inform about any deviations or anomalies	5
4. Discuss the importance of complying with standard policies and procedures for team work and respecting the personal and professional space of colleagues and superiors	1. Role of complying with standard policies and procedures for team work		5
Total			30

6. ORGANISATION OF FIELD VISITS

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

Visit a 3D Printing Laboratory and observe the following: Design of 3D Printer, material used, procedure of 3d printing an object, requirements and essential material and tools for 3d printing etc. During the visit, students should obtain the following information from the owner or the Lab Assistant of the laboratory:

1. 3D Printing activity being taken
2. Technology adopted
3. Type of material used
4. Manpower engaged
5. Total expenditure of project

6. Total annual income
7. Rubber Industry

7. LIST OF EQUIPMENTS 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. 3D Printer
2. Filament for FDM printers
3. Resin (If required) for SLA
4. Build Plates
5. Extruder Nozzles
6. 3D modeling software like GoogleSketch, Sketchup etc.
6. Bed leveling tools
7. Slicing Software
8. 3D Scanners
9. Calipers and measuring tools
10. Safety equipment
11. Post processing tools
12. 3d filament pen
13. UV Curing station for SLA
14. Storage Solutions
15. Computer workstation
16. Power Protection
17. Filament dryer
18. Consumables such as zip ties, adhesives etc.
19. Educational materials such as whiteboard, projectors etc.
20. Workbenches and workstations

8. VOCATIONAL TEACHER'S AND 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
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1.	<p>Graduation from any stream from a recognized Institute /University, with at least 1-year work / teaching experience</p> <p>Or Diploma in any discipline with 2-year work / teaching experience</p> <p>Or B.Voc with at least 1 year work / teaching experience.</p>	<ul style="list-style-type: none"> • Effective communication skills (oral and written) • Basic computing skills. 	<p>18-37 years (as on Jan. 01 (year))</p> <p>Age relaxation to be provided as per Govt. rules.</p>
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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 Samagra Shiksha in the following ways:

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

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 organizations 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:

Written test for the technical/domain specific knowledge related to the sector;

Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and 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.

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:

- Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
- Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
- Make effective use of learning aids and ICT tools during the classroom sessions;
- 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;
- Work with the institution's management to organize skill demonstrations, site visits, on- job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
- Identify the weaknesses of students and assist them in up-gradation of competency;
- Cater to different learning styles and level of ability of students;
- Assess the learning needs and abilities, when working with students with different abilities
- Identify any additional support the student may need and help to make special arrangements for that support;
- 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:

Participation in guidance and counseling activities conducted at Institutional, District and State level;

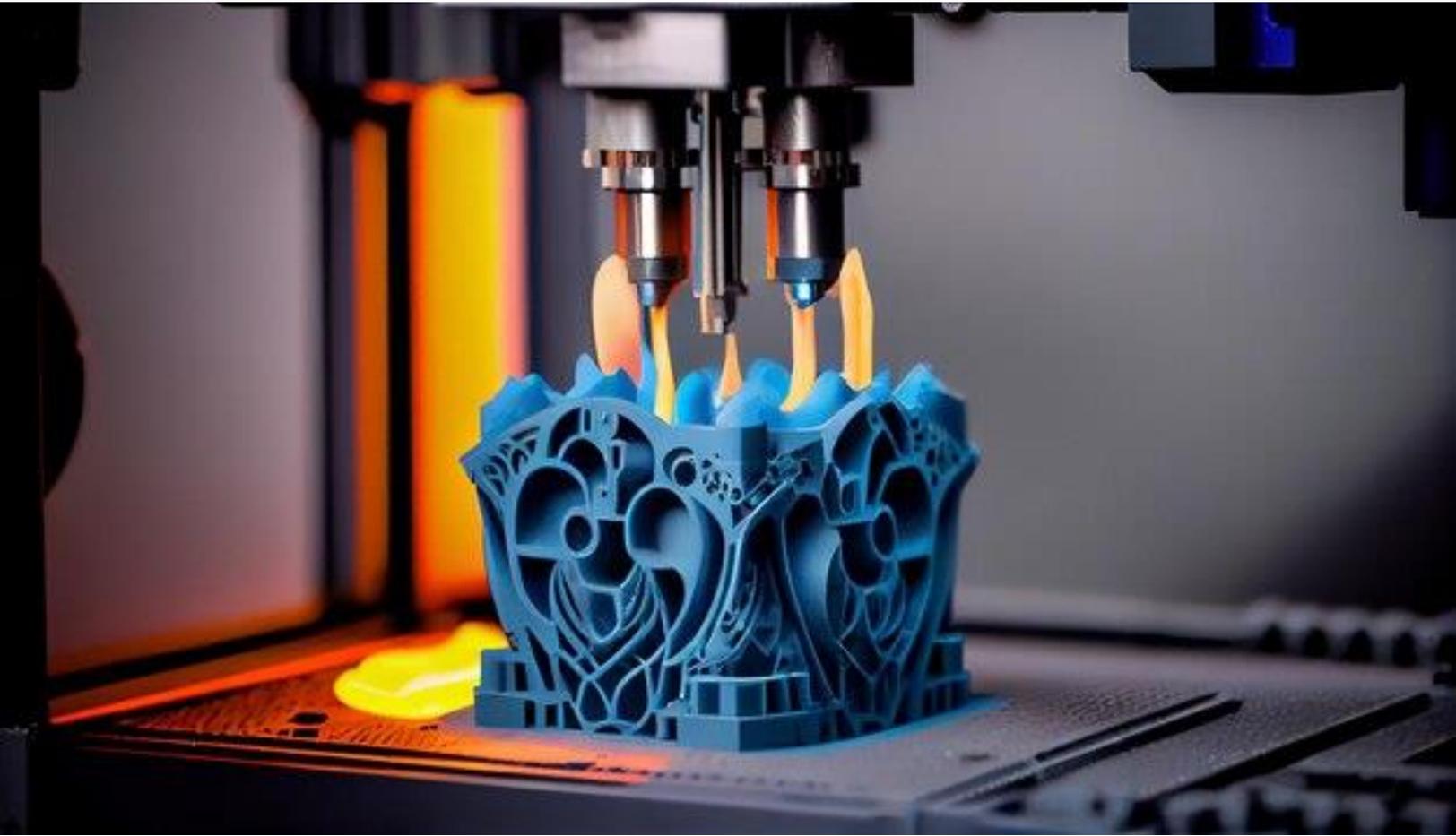
- Adoption of innovative teaching and training methods;
- Improvement in result of vocational students of Class X or Class XII;
- Continuous up-gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;

- Membership of professional society at District, State, Regional, National and International level;
- Development of teaching-learning materials in the subject area;
- Efforts made in developing linkages with the Industry/Establishments;
- Efforts made towards involving the local community in Vocational Education
- Publication of papers in National and International Journals;
- Organization of activities for promotion of vocational subjects;
- Involvement in placement of students/student support services.

9. LIST OF CONTRIBUTORS

Prof. Saurabh Prakash,
Professor and Head
Engineering and Technology Department, PSS Central Institute of Vocational Education,
Bhopal, M.P-462002

Mr. Neeraj Bhandari
Assistant Professor
Engineering and Technology Department,
PSS Central Institute of Vocational Education, Bhopal, M.P-462002



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एन सी ई आर टी
NCVET

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

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

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