LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: Solar Pump Technician

(QUALIFICATION PACK: Ref. Id. AGR/6701)

SECTOR: Agriculture

Classes 11and12

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

(a constituent unit of NCERT, under MHRD, 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.

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Solar Pump Technician, AGR/6701

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FOREWORD

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent unit of National Council of Educational Research and Training (NCERT) is spearheading the efforts of developing learning outcome based vocational curriculum and courseware aimed at integrating both vocational and general qualifications to open pathways of career progression for students. It is a part of Vocationalisation of Education under *Samagra Shiksha*. The PSS Central Institute of Vocational Education (PSSCIVE) is developing curricula under the project approved by the Project Approval Board (PAB) of *Samagra Shiksha* of Ministry of Human Resource Development (MHRD), Govt. of India. The main purpose of the learning outcome based vocational curriculum is to bring about improvement in teaching-learning process and working competencies through learning outcomes embedded in the vocational subject.

It is a matter of great pleasure to introduce this learning outcome based vocational curriculum as part of the vocational training package for the job role of **Solar Pump Technician (AGR/6701).** The curriculum has been developed for the higher secondary students of vocational education and is aligned to the National Occupation Standards (NOSs) of a job role identified and approved under the National Skill Qualification Framework (NSQF).

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 needs. The teaching process is to be performed through the interactive sessions in classrooms, practical activities in laboratories and workshops, projects, field visits, and professional experiences.

The curriculum has been developed and reviewed by a group of experts and their contributions are greatly 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.

HRUSHIKESHSENAPATY
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 are 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. The much-discussed demographic dividend will bring sustaining benefits only if this young workforce is skilled and its potential is channelized in the right direction.

In order to fulfil the growing aspirations of our youth and the demand of skilled human resource, the Ministry of Human Resource Development (MHRD), Government of India introduced the revised Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education in 2012with the aim 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. The scheme was subsumed in *SamagraShiskha* in 2018 along with other schemes of school education. For spearheading the Vocationalisation Education, the PSS Central Institute of Vocational Education (PSSCIVE) was entrusted the responsibility to develop learning outcome based vocational curriculum, student workbooks, teacher handbooks and e-learning materials for the job roles in various sectors, with growth potential for employment.

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 the society and the world of work. In order to honour its commitment to the nation, the PSSSCIVE has initiated the work on developing learning outcome based vocational curriculum with the involvement of faculty members and leading experts in respective fields. It is being done through the concerted efforts of leading academicians, professionals, policy makers, partner institutions, Vocational Education and Training 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. Currently, the Institute is working on developing curricula and courseware for over 50job roles in various sectors, besides the curricula developed for 100 job roles.

We extend our gratitude to all the contributors for selflessly sharing their precious knowledge, acclaimed expertise, valuable time and positively responding to our request for development of curriculum. We are grateful to MHRD and NCERT for the financial support and cooperation in realising the objective of providing learning outcome based vocational curriculum and courseware to the States and other stakeholders under the PAB (Project Approval Board) approved project of *Samagra Shiksha of* Ministry of Human Resource Development (MHRD), Government of India.

Finally, for transforming the proposed curriculum design into a vibrant reality of implementation, all the institutions involved in the delivery system shall have to come together with a firm commitment and they should secure optimal community support. The success of this curriculum depends upon its effective implementation and it is expected that the managers of vocational education and training system, including subject teachers will make efforts to create better facilities, develop linkages with the world of work and foster a conducive environment as per the content of the curriculum document.

The PSSCIVE, Bhopal remains committed in bringing about reforms in the vocational education and training system through the learner-centric curricula and courseware. We hope that this document will prove useful in turning out more competent Indian workforce for the 21st Century.

RAJESH P. KHAMBAYAT
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 Human Resource Development (MHRD), Government of India for the financial support to the project for development of curricula.

We are grateful to the Director, National Council of Educational Research & Training (NCERT) for his support and guidance. We also acknowledge the contributions of our colleagues at the Technical Support Group of Samagra Shiksha, MHRD, National Skill Development Agency (NSDA) and National Skill Development Corporation (NSDC) and Automotive Skill Development Council (ASDC) for their academic support and cooperation.

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

We are also grateful to Dr. Saurabh Prakash, Professor and Course Coordinator, Department of Engineering and Technology, PSSCIVE, Bhopal for her contributions.

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

The assistance provided by Dr. Satyendra Thakur, Consultant, Er. Kuber Singh, Consultant, and Mr. Vinod K. Soni, Computer Operator Gr.II, Department of Engineering and Technology for layout, design and composing of the material is duly acknowledged.

PSSCIVE Team

CONTENTS

1. COURSE OVERVIEW

COURSE TITLE: Solar Pump Technician AGR/6701

The present curriculum Solar Pump Technician job role fulfils the needs of the students willing to learn activities relating to the Solar Pump Technician job role. Any student/ entrepreneur willing to start a Solar Pump Service Centre can acquire the desired competencies with the help of this curriculum. Solar Pump Technician connects the solar PV module to the battery and the pump to provide water to the crops in areas where electricity is inaccessible or erratic. This job role of the Solar Pump Technician is to install solar PV module on a mount/pole, connect it to the battery/inverter and the pump and connect the pump to the water source and destination. It also requires technician to work under the sun for long duration and have to work in rural and agricultural areas.

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

- ☐ Identify the principal components of a computer system
- ☐ Identify and control hazards in the workplace that pose a danger or threat to their safety or health, or that of others.
- ☐ 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.
- ☐ Communicate effectively with the customers
- ☐ Understand the work requirement of solar pump system
- ☐ Check out and assess the solar system
- ☐ Understand the installation requirement of solar pump system
- ☐ Do the designing of solar pump system
- ☐ Collect materials required for installation of solar pump system
- ☐ Do the installation of solar pump system in the field
- ☐ Ensure quality material usage and appropriate handling mechanism
- ☐ Repair and maintain the minor and major mechanism of solar pump system.

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

COURSE LEVEL: This is a course for class XI and XII. On completion of this course, a student can take up a higher level course in the area of Solar Pump Sector.

COURSE DURATION: **600 hrs**

Class 11	:	300 hrs
Class 12	:	300 hrs
Total	**:**	**600 hrs**

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 Class 11 and 12 opting for vocational subject along with general education subjects. The unit-wise distribution of hours and marks for Class11 is as follows:

CLASS 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	**10**
	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	
		110	**10**
Part B	**Vocational Skills**		
	Unit 1 : Introduction of solar Energy	30	**40**
	Unit 2: Tools for Solar systems installations	50	
	Unit 3: Major components of solar pump and their system	60	
	Unit 4 : Work and safety	25	
		165	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
		10	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
		15	**15**
	Grand Total	**300**	**100**

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

CLASS 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	20	10
	Unit 2 : Self-management Skills-IV	10	
	Unit 3 : Information and Communication Technology Skills-IV	20	
	Unit 4 : Entrepreneurial Skills-IV	15	
	Unit 5 : Green Skills-IV	10	

		110	**10**
Part B	**Vocational Skills**		
	Unit 1: Installation and commissioning of solar pumping system	80	40
	Unit 2: Repair and Maintenance of Solar Pump	30	
	Unit 3: Cost economics of solar pump and opportunities	30	
	Unit 4: Innovation and development in solar energy	25	
		165	**40**
Part C	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
		10	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
		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 or teaching 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. ASSESSMENT 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, 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

It 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: 30

		No. of Questions			
S.No.	**Typology of Question**	**Very Short Answer (1 mark)**	**Short Answer (2 Marks)**	**Long Answer (3 Marks)**	**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, private 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=5**	**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.

Project Work (individual or group project) is 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, and photos of products prepared by students in relation to the unit of competency.

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.

CONTINUOUS AND COMPREHENSIVE EVALUATION

Continuous and Comprehensive Evaluation (CCE) refers to a system of school-based evaluation of students that covers all aspects of student's development. In this scheme, the term `continuous' is meant to emphasize that evaluation of identified aspects of students `growth and development' is a continuous process rather than an event, built into the total teaching-learning process and spread over the entire span of academic session. The second term `comprehensive' means that the scheme attempts to cover both the scholastic and the co-scholastic aspects of students' growth and development. For details, the CCE manual of Central Board of Secondary Education (CBSE) or the guidelines issued by the State Boards on the procedure for CCE should be followed by the Institutions.

5. UNIT CONTENTS

CLASS 11

Part A: Employability Skills

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

UNIT 1: COMMUNICATION SKILL - III

Learning Outcome	Theory (10 Hrs)	Practical (15 Hrs)	Duration (25 Hrs)
1. Demonstrate knowledge of various methods of communication	1. Methods of communication - Verbal - Non-verbal - Visual	1. Writing pros and cons of written, verbal and non-verbal communication 2. Listing do's and don'ts for avoiding common body language mistakes	10
2. Identify specific communication styles	1. Communication styles- assertive, aggressive, passive-aggressive, submissive, etc.	2. Observing and sharing communication styles of friends, teachers and family members and adapting the best practices 3. Role plays on communication styles.	10

3. Demonstrate basic writing skills	1. Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	1. Demonstration and practice of writing sentences and paragraphs on topics related to the subject	05
Total			**25**

UNIT 2: SELF-MANAGEMENT - III			
Learning Outcome	**Theory (10 Hrs)**	**Practical (15 Hrs)**	**Duration (25 Hrs)**
1. Demonstrate impressive appearance and grooming	1. Describe the importance of dressing appropriately, looking decent and positive body language 2. Describe the term grooming 3. Prepare a personal grooming checklist 4. Describe the techniques of self- exploration	1. Demonstration of impressive appearance and groomed personality 2. Demonstration of the ability to self- explore	07
2. Demonstrate team work skills	1. Describe the important factors that influence in team building 2. Describe factors influencing team work	1. Group discussion on qualities of a good team 2. Group discussion on strategies that are adopted for team building and team work	08
3. Apply time management strategies and techniques	1. Meaning and importance of time management – setting and prioritizing goals, creating a schedule, making lists of tasks, balancing work and leisure, using different optimization tools to break large tasks into smaller tasks.	1. Game on time management 2. Checklist preparation 3. To-do-list preparation	10
Total			**25**

UNIT 3: INFORMATION & COMMUNICATION TECHNOLOGY - III			
Learning Outcome	**Theory (08hrs)**	**Practical (12hrs)**	**Duration (20 Hrs)**
1. Create a document on word processor	1. Introduction to word processing. 2. Software packages for word processing.	1. Demonstration and practice of the following: • Listing the features	10

	3. Opening and exiting the word processor. 4. Creating a document	of word processing • Listing the software packages for word processing • Opening and exit the word processor • Creating a document	
2. Edit, save and print a document in word processor	1. Editing text 2. Wrapping and aligning the text 3. Font size, type and face. 4. Header and Footer 5. Auto correct 6. Numbering and bullet 7. Creating table 8. Find and replace 9. Page numbering. 10. Printing document. 11. Saving a document in various formats.	1. Demonstration and practising the following: • Editing the text • Word wrapping and alignment • Changing font type, size and face • Inserting header and footer • Removing header and footer 2. Using autocorrect option 3. Insert page numbers and bullet 4. Save and print a document	10
Total			**20**

UNIT 4: ENTREPRENEURSHIP DEVELOPMENT - III			
Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 Hrs)**
1. Describe the significance of entrepreneurial values and attitude	1. Values in general and entrepreneurial values 2. Entrepreneurial value orientation with respect to innovativeness, independence, outstanding performance and respect for work	1. Listing of entrepreneurial values by the students. 2. Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur 3. Exhibiting entrepreneurial values in Ice breaking, rapport building, group work and home assignments	10
2. Demonstrate the knowledge of attitudinal changes required to become an entrepreneur	1. Attitudes in general and entrepreneurial attitudes 2. Using imagination/ intuition 3. Tendency to take moderate risk 4. Enjoying freedom of expression and action	1. Preparing a list of factors that influence attitude in general and entrepreneurial attitude 2. Demonstrating and identifying own entrepreneurial attitudes during the	15

	5. Looking for economic opportunities 6. Believing that we can change the environment 7. Analyzing situation and planning action 8. Involving in activity	following micro lab activities like thematic appreciation test 3. Preparing a short write-up on "who am I" 4. Take up a product and suggest how its features can be improved 5. Group activity for suggesting brand names, names of enterprises, etc.	
Total			**25**

UNIT 5: GREEN SKILLS - III			
Learning Outcome	**Theory (07 hrs)**	**Practical (08 hrs)**	**Duration (15 Hrs)**
1. Describe importance of main sector of green economy	1. Main sectors of green economy- E-waste management, green transportation, renewal energy, green construction, water management 2. Policy initiatives for greening economy in India	1. Preparing a poster on any one of the sectors of green economy 2. Writing a two-page essay on important initiatives taken in India for promoting green economy	08
2. Describe the major green Sectors/Areas and the role of various stakeholder in green economy	1. Stakeholders in green economy 2. Role of government and private agencies in greening cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries	1. Preparing posters on green Sectors/Areas: cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries	07
Total			**15**

Part B: Vocational Skill

S. No.	Units	Duration (Hrs.)
1	Introduction of Solar Energy	30
2	Tools for Solar systems installations	50
3	Major components of solar pump and their system	60
4	Work and Safety	25
	Total	**165**

UNIT 1: INTRODUCTION OF SOLAR ENERGY			
Learning Outcome	**Theory (30 Hrs)**	**Practical (12 Hrs)**	**Duration (30 Hrs)**
1. Describe the various types of renewable energy sources	• Introduction of energy (Renewable energy and non-renewable energy) • Various types of Renewable energy • Advantage of using solar energy over other renewable energy sources- wind, hydro energy, heat, Biomass energy etc....,	• List the various types of renewable energy and non-renewable energy source • Preparing chart and poster • Draw the sketch of different energy sources	09
2. Describe the use of solar energy and its application	• Solar energy • Various application of solar energy (heat and PV energy) • Differentiate between energy coming from sun – heat and pv energy • Solar radiation and its types	• Make a list of various application and solar radiation instruments • Collect the solar radiation data in your location • Use of pyrometer	09
3. Explain the Solar PV Technology	• History and evolution of Solar PV technology • Identify the future scope of solar PV • Need of training in solar sector	• Draw the timeline of solar PV technology	04
4. Discuss the solar Power generation and current trend	• Solar power generation - Basic conversion and control of electrical system and its functions (use of storage - battery), • Current power production trend in India including solar energy.	• Make a chart or poster/ block diagram of solar power generation • Make a presentation of current power production • Collect the data of power consumption (number of units) in your home or any building	08
Total			**30**

UNIT 2: TOOLS FOR SOLAR PV SYSTEM INSTALLATIONS			
Learning Outcome	**Theory (26 Hrs)**	**Practical (24 Hrs)**	**Duration (50 Hrs)**
1. Identify and describe the various mechanical tool	• Mechanical tool used in solar system - operational - cutting, spanner, drill machine, hammer, chisel, grinder, wrench, LN keys, saw, power drill, scrapers, screw driver	• Identify the various mechanical tool for specific task • Draw the sketch of mechanical tool and label it • Demonstrate the different mechanical tool (cutting, spanner, drill machine, hammer, chisel, grinder, wrench, LN keys, saw, power drill, scrapers, screw driver) • Perform practical of all mechanical tool operations like cutting, spanner, drill machine, hammer, chisel, grinder, wrench, LN keys, saw, power drill, scrapers, screw driver	10
2. Identify and describe the various electrical tool	• Electrical tool used in solar system – multimeter, earth tester/megger, tester electrical insulator, pliers, crimper	• Identify the various electrical tool for specific task • Draw the sketch of electrical tool and label it • Demonstrate the different electrical tool (multimeter, earth tester/ megger, tester electrical insulator, pliers, crimper) • Perform practical of all electrical tool operations (like multimeter, earth tester/megger, tester electrical insulator, pliers, crimper)	10
3. Describe the various safety tool	• Safety tools used in solar system – personnel protective equipment kit	• Identify the various safety tool for specific task • Demonstrate the different safety tool • Perform practical of all safety tool operations	08
4. Identify and use the different marking tool	• Marking tool used in solar system - compass, measurement level, marking thread, angle finder tape, spirit,	• Perform the practical of Measuring tool like compass, measurement level, marking thread, angle finder tape, spirit	08
5. Identify and use the civil tool used in solar system	• Civil tools used in solar system - pickaxe, spud, mortar pan, spade, crowbar, water pump	• Identify the various Civil tools for specific task • Draw the sketch of Civil tool and label it	06

	pliers	• Demonstrate the different Civil tool (pickaxe, spud, mortar pan, spade, crowbar, water pump pliers) • Perform practical of all Civil tool operations (like pickaxe, spud, mortar pan, spade, crowbar, water pump pliers)	
6. Describe the different electrical parameters	• Measurement of electrical parameters- voltage, AC and DC current, earthing, resistance.	• Check the, AC and DC voltage, • Check the earthing resistance.	04
7. Describe the solar PV on grid and off grid systems	• Solar PV systems – on grid and off grid • Advantage and disadvantage of solar PV system - on and off grid • Conversion of off grid system into on grid system	• Make a chart or poster of on grid and off grid system • Draw the line diagram of on grid and off grid system	04
Total			**50**

UNIT 3: MAJOR COMPONENTS OF SOLAR PUMP AND THEIR SYSTEM			
Learning Outcome	**Theory (30 Hrs)**	**Practical (30 Hrs)**	**Duration (60Hrs)**
1. Describe the solar pump and its types	• Solar pump and its types- AC and DC pumps, submersible and surface solar pump • Use and advantage of solar pump	• Identify the AC and DC solar pump submersible and surface solar pump, • Draw the line diagram AC and DC solar pump, submersible and surface solar pump	05
2. Identify the solar panel and its types	• Solar panels, • types and its capacity, • size, • specification • Differentiate between different types of solar panel	• Make chart of different types of solar panel according to - efficiency, - size, - capacity, - specification • Demonstration of solar panel	05
3. Explain the mounting structure and their different types	• Mounting structure and its different types, material and accessories, system tracking- daily and seasonal, automatic and manual • Different types of fastening accessories	• Identify the different types of mounting structure and accessories • Make a list of daily, seasonal, automatic and manual tracking system • Identify the different	12

	used in mounting structure	types of fastening accessories • Draw the sketch of different types of fastening accessories	
4. Describe the power conditioning unit	• Power conditioning unit - Charge controller and its different types, operation - Soft starter (Variable frequency drive)	• Identify the power conditioning unit • Power testing of conditioning unit using multimeter for voltage, earthen, resistance • Check the power by using tester	10
5. Able to explain inverter and its types	• Inverters - its different types (in case of AC Pumps) - advantage of inverter • Circuit diagram of inverter connection • Step for operating inverter	• Testing connection between inverter and battery and their outcomes • Connect the inverter connection as per circuit diagram • Operate the inverter as per instruction manual	08
6. Able to explain features of battery energy storage unit	• Battery energy storage and its condition - DOD (depth of discharge) - SOC (state of charge) • Rating of battery according to hours	• Identify the component of battery - terminals, - Cells, - electrolyte, - packing • Reading of specification sticker paste on the battery body	05
7. Identify the different cable connection	Use and advantage of following: • Cables selections, - DC cable, - AC cable, - UV protected cable • Distribution boxes, types of box, - MCB (AC & DC) - SPD (AC & DC) - Fuse (AC & DC), • IP(Ingress protection) rating	• Identification of single and multi-cable • Measurement of thickness of wire • Make chart of different types of cables according to gauge and its material • Identify different MCB, SPD, Fuse, IP rating according to reading of specification	05
8. Explain the importance of earthing systems and its types	• Importance of earthing systems and their types, - maintenance free/ chemical earthing system, - earthing electrode, - earthing back fill	• visit to the solar pv site and check the earthing system • Measure earthing resistance with megger • Identify the components of lighting arrestor	05

	compound, • Lighting arrester and its uses and importance • Use of remote monitoring systems and its type and technology		
9. Explain the different type of conduit used in cable	• Conduit and its types, cable dressing accessories- cable and conduit gland, cable tie and its types, cable and conduit clips, lugs- aluminium and copper, MC4 (multi contact 4) connector and its type	• Identify the different type of conduit cable • Make a list of different type of conduit cable • Identify the MC4 connector • Assembling of MC4 connector	05
Total			**60**

UNIT 4: WORK AND SAFETY			
Learning Outcome	**Theory (15 Hrs)**	**Practical (10 Hrs)**	**Duration (25 Hrs)**
1. Explain the tool box talk and different type of hazard in installation	• Tools box talk- talking about safety at work, identify hazard of today's work and take precaution during installation, talk about safety tools and current work	• Perform the role play on tool box talk • Make a list of hazards and precaution to be taken during installations	05
2. Discuss and perform the different safety drill practices	• Safety drill - demonstration about PPE, - demonstration of gathering point and different safety measures - CPR, - first aid, practice - evacuation plant • Safety regulation- industrial and construction safety act and practise	• Demonstrate how to use PPE kit and its importance • Demonstration of First aid box • Demonstration of CPR • Make a chart of important Govt. Regulation act	08

3. Describe different type of safety kit	• Use of PPE kit - helmet and its types, - gloves, - shoe, - apron, - harness • First aid – discuss about first aid material • Hazard sign board - electrical hazard sign boards, - precaution sign board, - safety measures sign board, - emergency and emergency number sign board • Hazard identification- A. Electrical safety - Shock prevention - First aid after electrical shock. B. Fire hazard - types and use of fire extinguisher - fire exit plan C. Work at height hazard - use of safety harness	• Identify different type of safety kit • Mock Practice of using first aid • Make a chart and poster of different hazard sign and emergency sign • Identification of different components of fire extinguisher • Practice and handling of fire extinguisher • Perform the operation of safety harness during work at heights	12
Total			**25**

CLASS 12

Part A: Employability Skills

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills – IV	25
2.	Unit 2: Self-management Skills –IV	25
3.	Unit 3: Basic ICT Skills –IV	20
4.	Unit 4: Entrepreneurial Skills –IV	25
5.	Unit 5: Green Skills –IV	15
	Total	**110**

UNIT 1: COMMUNICATION SKILLS – IV			
Learning Outcome	**Theory (10 Hrs)**	**Practical (15 Hrs)**	**Duration (25 Hrs)**
1. Describe the steps to active listening skills	• Importance of active listening at workplace • Steps to active listening.	• Demonstration of the key aspects of becoming active listener. • Preparing posters of steps for active listening.	10
2. Demonstrate basic writing skills	• Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject.	15
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 self-motivation	• Finding and listing motives (needs and desires); • Finding sources of motivation and inspiration (music, books, activities); expansive thoughts; living fully in the present moment; dreaming big.	• Group discussion on identifying needs and desire. • Discussion on sources of motivation and inspiration.	10

2. Describe the basic personality traits, types and disorders	• Describe the meaning of personality. • Describe how personality influences others. • Describe basic personality traits. • Describe common personality disorders- paranoid, antisocial, schizoid, borderline, narcissistic, avoidant, dependent and obsessive.	• Demonstrate the knowledge of different personality types.	15
Total			**25**

UNIT 3: BASIC INFORMATION AND COMMUNICATION TECHNOLOGYSKILLS – IV			
Learning Outcome	**Theory (06 Hrs)**	**Practical (14 Hrs)**	**Duration (20 Hrs)**
1. Perform tabulation using spreadsheet application	• Introduction to spreadsheet application, • Spreadsheet applications, • Creating a new worksheet, • Opening workbook and entering text, • Resizing fonts and styles, • Copying and moving, • Filter and sorting, • Formulas and functions, • Password protection, • Printing a spreadsheet, • Saving a spreadsheet in various formats.	• Demonstration and practice on the following: • Introduction to the spreadsheet application, • Listing the spreadsheet applications, • Creating a new worksheet, • Opening the workbook and enter text, • Resizing fonts and styles, • Copying and move the cell data, • Sorting and Filter the data, • Applying elementary formulas and functions, • Protecting the spreadsheet with password, • Printing a spreadsheet, • Saving the spreadsheet in various formats.	10

2. Prepare presentation using presentation application	• Introduction to presentation, • Software packages for presentation, • Creating a new presentation, • Adding a slide, • Deleting a slide, • Entering and editing text, • Formatting text, • Inserting clipart and images, • Slide layout, • Saving a presentation, • Printing a presentation document.	• Demonstration and practice on the following: • Listing the software packages for presentation, • Explaining the features of presentation, • Creating a new presentation, • Adding a slide to presentation, • Deleting a slide, • Entering and edit text, • Formatting text, • Inserting clipart and images, • Sliding layout, • Saving a presentation, • Printing a presentation document.	10
Total			**20**

UNIT 4: ENTREPRENEURIAL SKILLS – IV			
Learning Outcome	**Theory (10 Hrs)**	**Practical (15 Hrs)**	**Duration (25 Hrs)**
1. Identify the general and entrepreneurial behavioral competencies	• Barriers to becoming entrepreneur. • Behavioral and entrepreneurial competencies – adaptability/ decisiveness, initiative/perseverance, interpersonal skills, organizational skills, stress management, valuing service and diversity.	• Administering self-rating questionnaire and score responses on each of the competencies. • Collect small story/anecdote of prominent successful entrepreneurs. • Identify entrepreneurial competencies reflected in each story and connect it to the definition of behavioral competencies. • Preparation of competency profile of students.	10

2. Demonstrate the knowledge of self-assessment of behavioral competencies	• Entrepreneurial competency in particular: self-confidence, initiative, seeing and acting on opportunities, concern for quality, goal setting and risk taking, problem solving and creativity, systematic planning and efficiency, information seeking, persistence, influencing and negotiating, teambuilding.	• Games and exercises on changing entrepreneurial behavior and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and creativity.	15
Total			**25**

UNIT 5: GREEN SKILLS – IV			
Learning Outcome	**Theory (05 Hrs)**	**Practical (10 Hrs)**	**Duration (15 Hrs)**
1. Identify the role and importance of green jobs in different sectors	• Role of green jobs in toxin-free homes. • Green organic gardening, public transport and energy conservation, • Green jobs in water conservation. • Green jobs in solar and wind power, waste reduction, reuse and recycling of wastes, • Green jobs in green tourism • Green jobs in building and construction. • Green jobs inappropriate technology. • Role of green jobs in Improving energy and raw materials use • Role of green jobs in limiting greenhouse gas missions • Role of green jobs minimizing waste and pollution • Role of green jobs in protecting and restoring ecosystems • Role of green jobs in support adaptation to the effects of climate change	• Listing of green jobs and preparation of posters on green job profiles. • Prepare posters on green jobs.	15
Total			**15**

Part B: Vocational Skills

S. No.	Units	Duration (Hrs.)
1	Installation and commissioning of solar pumping system	80
2	Repair and Maintenance of Solar Pump	30
3	Cost economics of solar pump and opportunities	30
4	Innovation and development in solar energy	25
	Total	**165**

UNIT 1: INSTALLATION AND COMMISSIONING OF SOLAR PUMPING SYSTEM			
Learning Outcome	**Theory (30 Hrs)**	**Practical (50 Hrs)**	**Duration (80 Hrs)**
1. Describe about site survey measurements, space availability, shadow analysis, Soil characteristics, understanding of site feasibility report and pump discharge capacity and motor	• Site survey- measurements, space availability, shadow analysis, Soil characteristics, understanding of site feasibility report and pump discharge capacity and motor • Performance criteria of solar pump	• Make a list of criteria for site selection • Check the soil characteristics at the installation site • Visit to the solar pump site and see the effect of the shadow of tree or building, electric poll etc,. • Identify the place of pump at the site • Identify the pump discharge capacity • Check motor capacity • Make feasibility report of site	15
2. Identify and select the design of solar pumping system	• Selection and design of solar pumping system, understanding of single line diagram	• Identification of different types solar pump • Reading and understanding single line diagram • Identify different components of solar pump	08
3. Describe the important design and evaluation features	• Design and evaluation of various parameter tools involved in installation of system, String formation- • Load calculation- Measurement of volts, amps and watts: series and parallel connection, cable sizing, • DC volt size, weather effect • Different parameters related with water pump like pump head, bore size	• List of various parameter tools used in solar pump installation • Calculate load - volt, amp • Identify the series and parallel connection according to requirement of the system • Calculate load in series and parallel connection	20

	and discharge, existing ground water table • Water quality (hard and soft water) • Use of compass and GPS to identify the direction and azimuth angle for installation of solar panel	• Calculate the cable size selection • Identify DC volt size • Collect the information of weather condition • Demonstration of standard operating procedure • Identifying the different parameters related to water pump like pump head, bore size, discharge, casing, and water table • Checklist of different parameters of water pump • Identify a viability of grid • Identify the water quality like hard and soft water • Identify the features of compass and GPS • Handling and reading of compass and GPS • Find the direction of solar pump by using compass and GPS	
4. List the material handling procedure	• Material procurement and handling, transportation and storage - loading and unloading material, • Handling procedure	• List the specifications of material and equipment • Make a list of supplier or company related to solar unit	05
5. Construct the foundation for solar water pump unit	• Civil work, RCC piling, mounting structure and Installation Procedure,	• Write the procedure of making foundation • Write the step of solar pump installation procedure • Visit the solar site • Construction of civil block • Marking and layout of civil block on ground • Prepare concrete mixer for RCC	12
6. Describe the cable connection used in solar installation	• AC & DC cabling and inter connection, • Physical connection, • Pump connection - electrical, - starter - structure	• Identify the AC & DC cabling and inter connection • Check the AC & DC cabling and inter connection • Check physical	06

		connection • rusting in electrical • loose and break connection • Check the pump connection like electrical , starter and structure	
7. Mounting of solar panel on structure	• Mounting of solar panel on structure, features and procedure	• Identify the mounting structure for solar panel • Visit the solar pump site	10
8. Discuss the quality parameters	• Quality assurance	• Write the step to check quality assurance	04
Total			**80**

UNIT 2: REPAIR AND MAINTENANCE OF SOLAR PUMP			
Learning Outcomes	**Theory (15 Hrs)**	**Practical (15 Hrs)**	**Duration (30 Hrs)**
1. Describe the procedure of cleaning and testing of solar panel	• Cleaning and testing of solar panel, procedures and schedule • Routine checkup of solar pump	• Write cleaning procedure - every 15 days - do not use any chemical - use water, wiper • Check pump discharge • Check the wire and terminal connection • Check solar panel position	15
2. Checking of solar panel mounting systems and identify the different faults in the solar PV system	• Checking of solar panel mounting, nut, bolts and angle of tilt • Sunlight and direction assessment • Basics of battery functioning and service • Checking of water pipeline • Checking of electrical connection • Pumping equipment's and its functioning, maintenance procedure of equipment's	• Visit the solar pump site to check the tilt angle and mounting structure condition • Check the nut and bolt for loose connection and tight it. • Identify the direction by using compass • Identify the basic function and features of battery • Check leakage and blockage in the water supply pipeline • Check the all electrical terminal connection • Identify pumping equipment's • Write the maintenance	15

		procedure • Identify defective components and its replacement like wire cut, burned, carbon supply, twist etc.,	
Total			**30**

UNIT 3: COST ECONOMICS OF SOLAR PUMP AND OPPORTUNITIES			
Learning Outcomes	**Theory (15 Hrs)**	**Practical (15 Hrs)**	**Duration (30 Hrs)**
1. Calculate the cost of solar pump installation	• Cost calculation for solar pump, solar panel as per capacity • Prepare a project plan	• Identify the different types of solar panel • Read and note down the specification of solar panel • Make a project report • Make a PPT for project plan • Present a seminar on project plan	10
2. Describe the business strategies, government scheme and policy	• Business opportunities and market trend, Govt. Project and Policy, • Net metering	• Identify the different business opportunities and market trend • Make a list of govt. project and policy • Check the net metering policy of your state/ central govt. scheme • Collect the information from vendor about solar pumping system	05
3. Explain the different marketing strategies- add on, solar pump spare parts	• Different marketing strategies- add on, solar pump spare parts	• Identifying different marketing strategies- add on, solar pump spare parts • Make a chart or poster of different marketing strategies- add on, solar pump spare parts	07
4. Describe about work effective and annual maintenance	• Work effective with others (as a team or individual) • Follow-up and annual Maintenance	• Make a list of company or vendor • Role play and group discussion on work • Reading of the annual maintenance report of solar pump according specification	08
Total			**30**

UNIT 4: INNOVATION AND DEVELOPMENT IN SOLAR ENERGY			
Learning Outcomes	**Theory (15 Hrs)**	**Practical (10 Hrs)**	**Duration (25 Hrs)**
1. Describe the innovations in different solar products	• Solar product - home lighting system - lantern, - solar torch, - solar water heater, - solar cooker, - solar power bank, - solar street light, - solar e-rickshaw, - solar charging station	• Identification of solar products • Reading of specification all solar products • Make a list of solar • Product and its price • Evaluate the solar product in your area	15
2. Explain new solar technology	• New solar technology - solar bifacial, -BIPV (Building integrated photo voltaic) • Standard for solar system-BIS, IEC code • Flexible solar panel (thin film) • Solar dryer • Solar desalination plant • Solar fencing	• Visit the solar panel to check the power outputs • Identify the features of solar panel • Collect the information from the websites and make a project report • Make a chart or poster of BIS,IEC Code • Identify different type of Solar Panel film • Identify different type of solar dryer • Make a chart of solar dryer • Visit solar desalination plant • Visit the site to check the solar fencing	10
Total			**25**

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 like. Solar Pump Farm/ Company, Solar Fair, Different section of show room and service centre, Telecaller centre, Service centre

Visit a Solar Pump Company and service centre and observe the following: During the visit, students should obtain the following information from the owner or the supervisor of the showroom:

1. Activity of Solar pump company and service centre
2. Different section of show room and service centre
3. Service centre
4. Sale procedure
5. Manpower engaged
6. Total expenditure of showroom
7. Total annual income
8. Profit/Loss (Annual)

9. 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.

Tools and Equipment

A complete unit of Solar photovoltaic system- solar photovoltaic power plant-750 KWH, Solar power meter (pyranometer), Solar photovoltaic inverter, Solar water pump- submersible pump and non- submersible pump, Battery,

Tool kit, Electrician knife, water leveller, PVC mallet, Fuse puller, Tong tester AC/DC, Multi meter, Water testing instrument (TDS meter), Earthing rod, Soldering iron and flux, Phase sequence meter, Inclinometer. Clamp meter, earth tester, drill machine and torque wrench, compass,

Spirit level/water level, drill machine, double ended flat and ring spanner, combination plier, side cutting plier. Nose pliers, wire stripper, hacksaw frame with blade, screw driver, torque wrench, wire stripper, measuring tape, line dori, plumb bob, Vernier caliper, Allen key set , Cable ties, Charge controller, Connecting wires, Lead solder, Load (AC/DC), Measuring tape, Centre punch, Standard wire gauge, MC4 connectors, Mechanical fixtures required for panel installation, PUCs, Cable cutter, Screw driver set , solar chart, Solar conversion kits, Soldering flux, solar panels, soldering iron, wire stripper, safety helmet, safety belt, Nose mask, Safety goggles, ear plug, cotton hand glove,

Solar products

- Solar product
  - home lighting system
  - lantern,
  - solar torch,
  - solar water heater,
  - solar cooker,
  - solar power bank,
  - solar street light,
  - solar e-rickshaw,
  - solar charging station

Training materials and First Aid kit

- Teaching Aids: Charts, CBTs, LCD Projector and Videos.
- Cleaning equipment and solutions
- SOP Charts on safety norms and drills
- Charts of dos and Don'ts in work area.
- Audio/video on English, Hindi or local language course
- Reference books
- Work books
- Study for Soft Skills
- CBTs on working on computer

8. VOCATIONAL TEACHER'S/ TRAINER'S 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.	Degree in Civil , Agricultural , Mechanical, Electrical and Electronics Engineering from a recognized Institute /University, with at least 1 year work / teaching experience Or Diploma in Civil , Agricultural , Mechanical and Electrical and Electronics Engineering from a recognized Institute/ University, with at least 3 year work / teaching experience	• 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 Rashtriya Madhyamik Shiksha Abhiyan (RMSA). 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 up-gradation 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 up-gradation 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.

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