

LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE:

Field Technician – Washing Machine

(QUALIFICATION PACK: Ref. Id. ELE/Q3106)

SECTOR: Electronics

Classes 11 and 12



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

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January, 2020

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Published by:

Joint Director

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

FOREWORD

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE) a constituent of the National Council of Educational Research and Training (NCERT) is spearheading the efforts of developing learning outcome based curricula and courseware aimed at integrating both vocational and general qualifications to open pathways of career progression for students. It is a part of Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education (CSSVSHSE) launched by the Ministry of Human Resource Development, Government of India in 2012. The PSS Central Institute of Vocational Education (PSSCIVE) is developing curricula under the project approved by the Project Approval Board (PAB) of *Rashtriya Madhyamik Shiksha Abhiyan (RMSA)*. The main purpose of the competency based curricula is to bring about the improvement in teaching-learning process and working competences through learning outcomes embedded in the vocational subject.

It is a matter of great pleasure to introduce this learning outcome based curriculum as part of the vocational training packages for the job role of **Electronics – Field Technician Washing Machine**. The curriculum has been developed for the 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.

Hrushikesh Senapaty
Director
National Council of Educational Research & 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 fulfill 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 that aims to provide for the diversification of educational opportunities so as to enhance individual employability, reduce the mismatch between demand and supply of skilled manpower and provide an alternative for those pursuing higher education. For spearheading the scheme, the PSS Central Institute of Vocational Education (PSSCIVE) was entrusted the responsibility to develop learning outcome based curricula, 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 need 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 fulfill the needs of the society and the world of work. In order to honor its commitment to the nation, the PSSCIVE has initiated the work on developing learning outcome based curricula 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 course-ware for over 100 job roles in various sectors.

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. We are grateful to MHRD and NCERT for the financial support and cooperation in realising the objective of providing learning outcome based modular curricula and course-ware to the States and other stakeholders under the PAB (Project Approval Board) approved project of *Rashtriya Madhyamik Shiksha Abhiyan (RMSA)* of MHRD.

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 course-ware. 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

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 Rashtriya Madhyamik Shiksha Abhiyan (RMSA) 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, NCERT for his support and guidance. We also acknowledge the contributions of our colleagues at the Technical Support Group of RMSA, MHRD, RMSA Cell at the National Council of Educational Research and Training (NCERT), National Skill Development Agency (NSDA) and National Skill Development Corporation (NSDC) and Electronics Sector Skill Council of Indian (ESSCI) for their academic support and cooperation.

We are grateful to the expert contributors and Deepak D. Shudhalwar, Associate Professor (CSE), PSSCIVE, for their earnest effort and contributions in the development of this learning outcome based curriculum. Their contributions are dully acknowledged.

The contributions made by Vinay Swarup Mehrotra, Professor and Head, Curriculum Development and Evaluation Centre (CDEC), Vipin Kumar Jain, Associate Professor and Head, Programme Planning and Monitoring Cell (PPMC) and Deepak Shudhalwar, Associate Professor (CSE) and Head, Department of Engineering and Technology, PSSCIVE in development of the curriculum for the employability skills are duly acknowledged.

We are also grateful to the Course Coordinator Deepak D. Shudhalwar, Associate Professor (CSE), Head, Department of Engineering and Technology, PSSCIVE, for bringing out this curriculum in the final form.

PSSCIVE Team

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1. COURSE OVERVIEW

COURSE TITLE: Field Technician - Washing Machine

Field Technician - Washing Machine, also, called 'Washing Machine Repair Technician', this job is about providing after sales service to customers. The individual at work installs the washing machine, interacts with customers to diagnose the problem and assesses possible causes of fault reported. Once the problem and causes have been identified, the individual rectifies minor problems or replaces faulty modules for failed parts or recommends factory repairs for bigger faults. The individual must be willing to work in the field and travel through the day from one customer's premise to another. Punctuality, amenable behaviour, patience, good interpersonal relationship building, trustworthiness, integrity, and critical thinking are important attributes for this job. After completion of the job role on Field Technician – Washing Machine, the candidate may opt a career as a technician, service engineer. After having training on designing, s/he can become a product designer.

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

- ✓ Apply effective oral and written communication skills to interact with 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;
- ✓ Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
- ✓ Identify the basic parameters of electricity;
- ✓ Demonstrate to verify the Ohm's Law and Kirchhoff's Law;
- ✓ Develop an electric circuit and explain its types;
- ✓ Identify and list active, passive and electromechanical components used in a circuit;
- ✓ Demonstrate to read values of electronic components;
- ✓ Identify and use different hand tools and electronics tools;
- ✓ Identify the different types and models of washing machine with its features;
- ✓ Conduct pre-installation tasks;
- ✓ Conduct installation of washing machine;
- ✓ Conduct post-installation tasks;
- ✓ Perform troubleshooting to identify the fault and its cause;
- ✓ Repair or replace the dysfunctional part of washing machine;
- ✓ Perform post-repair check up and documentation;
- ✓ Identify, troubleshoot and resolve IoT application related issues;
- ✓ Identify, troubleshoot and resolve hardware related issues;
- ✓ Check the functionality after troubleshooting through mobile app;
- ✓ Comply with the standard safety procedures to maintain a safe work area;

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

COURSE LEVEL: This course can be taken up at Intermediate level in Class 11 and Class 12.

COURSE DURATION: Total : 600 hours
Class 11 : 300 hours
Class 12 : 300 hours

2. SCHEME OF UNITS AND ASSESSMENT

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

CLASS 11			
	Units	No. of Hours for Theory and Practical 300	Max. Marks for Theory & Practical 100
Part A	Employability Skills		
Unit 1	Communication Skills – III	25	10
Unit 2	Self-management Skills – III	25	
Unit 3	Basic ICT Skills – III	20	
Unit 4	Entrepreneurial Skills – III	25	
Unit 5	Green Skills – III	15	
	Total	110	10
Part B	Vocational Skills		
Unit 1	Basic Electricity	30	40
Unit 2	Basic Electronics	40	
Unit 3	Washing Technology	15	
Unit 4	Installation of Washing Machine	60	
Unit 5	Workplace Safety Measures	20	
	Total	165	40
Part C	Practical Work		
	Practical Examination	6	15
	Written Test	1	10
	Viva Voce	3	10
	Total	10	35
Part D	Project Work/Field Visit		
	Practical File/ Student Portfolio	10	10
	Viva Voce	5	5
	Total	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	25	10
Unit 2	Self-management Skills – IV	25	
Unit 3	Basic ICT Skills – IV	20	
Unit 4	Entrepreneurial Skills – IV	25	
Unit 5	Green Skills – IV	15	
	Total	110	10
Part B	Vocational Skills		
Unit 1	Repair and Maintenance of Washing Machine	75	40
Unit 2	Troubleshooting IoT applications in Washing Machine	50	
Unit 3	Advanced Technologies in Washing Machine	20	
Unit 4	Workplace Safety Measures	20	
	Total	165	40
Part C	Practical Work		
	Practical Examination	6	15
	Written Test	1	10
	Viva Voce	3	10
	Total	10	35
Part D	Project Work/Field Visit		
	Practical File/ Student Portfolio	10	10
	Viva Voce	5	5
	Total	15	15
	Total	300	100

3. TEACHING/TRAINING ACTIVITIES

The teaching and training activities have to be conducted in classroom, laboratory/ workshops and field visits. Students should be taken to field visits for interaction with experts and to expose them to the various tools, equipment, materials, procedures and operations in the workplace.

Special emphasis should be laid on the occupational safety, health and hygiene during the training and field visits.

CLASSROOM ACTIVITIES

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

PRACTICAL WORK IN LABORATORY/WORKSHOP

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

FIELD VISITS/ EDUCATIONAL TOUR

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

4. 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, 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

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

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, 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

Unit No.	Unit Name	Duration in Hours
Unit 1	Communication Skills – III	25
Unit 2	Self-management Skills – III	25
Unit 3	Basic ICT Skills – III	20
Unit 4	Entrepreneurial Skills – III	25
Unit 5	Green Skills – III	15
	Total	110

Unit 1: Communication Skills – III

Sn	Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	25 Hrs
1.	Demonstrate knowledge of various methods of communication	<ul style="list-style-type: none"> • Methods of communication • Verbal • Non-verbal • Visual 	<ul style="list-style-type: none"> • Writing pros and cons of written, verbal and non-verbal communication • Listing do's and don'ts for avoiding common body language mistakes 	5
2.	Identify specific communication styles	<ul style="list-style-type: none"> • Communication styles- assertive, aggressive, passive-aggressive, submissive, etc. 	<ul style="list-style-type: none"> • Observing and sharing communication styles of friends, teachers and family members and adapting the best practices • Role plays on communication styles. 	10
3.	Demonstrate basic writing skills	<ul style="list-style-type: none"> • Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph 	<ul style="list-style-type: none"> • Demonstration and practice of writing sentences and paragraphs on topics related to the subject 	10
			Total Duration in Hours	25

Unit 2: Self-management Skills – III

Sn	Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	25 Hrs
1.	Demonstrate impressive appearance and grooming	<ul style="list-style-type: none"> Describe the importance of dressing appropriately, looking decent and positive body language. Describe the term grooming Prepare a personal grooming checklist. Describe the techniques of self-exploration. 	<ul style="list-style-type: none"> Demonstration of impressive appearance and groomed personality. Demonstration of the ability to self- explore. 	07
2.	Demonstrate team work skills	<ul style="list-style-type: none"> Describe the important factors that influence in team building. Describe factors influencing team work. 	<ul style="list-style-type: none"> Group discussion on qualities of a good team. Group discussion on strategies that are adopted for team building and team work. 	08
3.	Apply time management strategies and techniques	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Game on time management. Checklist preparation. To-do-list preparation. 	10
			Total Duration in Hours	25

Unit 3: Basic ICT Skills – III

Sn	Learning Outcome	Theory (08 Hours)	Practical (12 Hours)	20 Hrs
1.	Create a document on word processor	<ul style="list-style-type: none"> Introduction to word processing. Software packages for word processing. Opening and exiting the word processor. Creating a document 	<ul style="list-style-type: none"> Demonstration and practice of the following: Listing the features of word processing, Listing the software packages for word processing, Opening and exit the word processor, Creating a document 	10
2.	Edit, save and print a document in word processor	<ul style="list-style-type: none"> Editing text Wrapping and aligning the text Font size, type and face. Header and Footer Auto correct 	<ul style="list-style-type: none"> Demonstration and practicing the following: Editing the text Word wrapping and alignment, 	10

		<ul style="list-style-type: none"> • Numbering and bullet • Creating table • Find and replace • Page numbering. • Printing document. • Saving a document in various formats 	<ul style="list-style-type: none"> • Changing font type, size and face, • Inserting header and footer, • Removing header and footer, • Using autocorrect option, • Insert page numbers and bullet, • Save and print a document. 	
			Total Duration in Hours	20

Unit 4: Entrepreneurial Skills – III

Sn	Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	25 Hrs
1.	Describe the significance of entrepreneurial values and attitude.	<ul style="list-style-type: none"> • Values in general and entrepreneurial values. Entrepreneurial value orientation with respect to inattentiveness, independence, outstanding performance and respect for work. 	<ul style="list-style-type: none"> • Listing of entrepreneurial values by the students. • Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur. • 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.	<ul style="list-style-type: none"> • Attitudes in general and entrepreneurial attitudes • Using imagination/ intuition • Tendency to take moderate risk • Enjoying freedom of expression and action • Looking for economic opportunities • Believing that we can change the environment • Analyzing situation and planning action • Involving in activity 	<ul style="list-style-type: none"> • Preparing a list of factors that influence attitude in general and entrepreneurial attitude. • Demonstrating and identifying own entrepreneurial attitudes during the following micro lab activities like thematic appreciation test. • Preparing a short write-up on "who am I". • Take up a product and suggest how its features can be improved. • Group activity for suggesting brand names, names of enterprises, etc. 	15
			Total Duration in Hours	25

Unit 5: Green Skills – III

Sn	Learning Outcome	Theory (07 Hours)	Practical (08 Hours)	15 Hrs
1.	Describe importance of main sector of green economy	<ul style="list-style-type: none"> Main sectors of green economy- E-waste management, green transportation, renewal energy, green construction, water management. Policy initiatives for greening economy in India. 	<ul style="list-style-type: none"> Preparing a poster on any one of the sectors of green economy. 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	<ul style="list-style-type: none"> Stakeholders in green economy. Role of government and private agencies in greening cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries. 	<ul style="list-style-type: none"> Preparing posters on green Sectors/Areas: cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries. 	07
			Total Duration in Hours	15

Class XI, Part B: Vocational Skills

Unit No.	Unit Name	Duration in Hours
Unit 1	Basic Electricity	30
Unit 2	Basic Electronics	40
Unit 3	Washing Technology	15
Unit 4	Installation of Washing Machine	60
Unit 5	Workplace Safety Measures	20
	Total Duration	165

Unit 1: Basic Electricity

Sn	Learning Outcome	Theory (12 Hours)	Practical (18 Hours)	30 Hrs
1.	Describe the basic concept of electricity	<ul style="list-style-type: none"> Definition of electricity, Types of electricity – AC, DC Definition of Current, Voltage, Resistance Concept of frequency and time period Electrostatics 	<ul style="list-style-type: none"> Switch on/ off the electrical appliances such as electric fan, TV, Refrigerator and observe the presence of electricity. Observe the presence of power in mobile phones 	8

		<ul style="list-style-type: none"> • Laws of Electrostatics • Potential and Potential difference • Concept of magnetic field • Comparison between magnetic circuit and electric circuit • Electromagnetic induction • Electromagnetic force emf • Measurement units of current, voltage and resistance 	<p>without connecting to electricity.</p> <ul style="list-style-type: none"> • Read the voltage, current, resistance, ratings of the appliances. • Demonstrate the experiment of magnetic attraction. • List the measurement units of voltage, current, resistance 	
2.	Verify the laws of electricity	<ul style="list-style-type: none"> • Ohm's law • Kirchhoff's law • Faraday's law of electromagnetic induction 	<ul style="list-style-type: none"> • Verify the ohm's law by using ohm's experiment. • Verify the Kirchhoff's law by using experiment. • Verify Faraday's law of electromagnetic induction 	4
3.	Identify and connect the electrical components in series and parallel combination	<ul style="list-style-type: none"> • Resistor and types of resistor • Resistance in series and parallel combination • Capacitor and types of capacitors • Capacitor in series and parallel combination • Charging and discharging capacitor • Inductor and types of inductor • Concept of resonance circuit • Series RLC and parallel RLC circuit • Concept of filter circuit • Band stop and band pass filter circuits 	<ul style="list-style-type: none"> • Identify different types of resistors. • Connect the resistor in series and parallel combination and measure effective resistance. • Identify different types of capacitors. • Connect the capacitors in series and parallel combination and measure effective capacitance. • Demonstrate the charging and discharging of capacitor • Identify different types of inductors. • Demonstrate the experiment of series and parallel RLC. • Demonstrate the experiment of band stop and band pass filter circuits 	10
4.	Describe the concept of power and motor	<ul style="list-style-type: none"> • Definition of power • Unit of power measurement • Maximum power transfer theorem • Self induction and mutual induction • AC motors, DC motors • Starter in motors 	<ul style="list-style-type: none"> • Read the power ratings on LED bulb. • Perform an experiment to demonstrate the working of AC motor and DC motor. 	8
			Total Duration in Hours	30

Unit 2: Basic Electronics

Sn	Learning Outcome	Theory (15Hours)	Practical (25 Hours)	40 Hrs
1.	Determine the values of basic electronic components	<ul style="list-style-type: none"> Relay, contractor and switches Electronic components Types of electronic components – active and passive components Colour code of resistors Colour code of capacitors Transformer, types of transformer 	<ul style="list-style-type: none"> Draw the symbol of the given relay, contractor and switches List the active and passive components and draw their symbols Determine the value of resistance by using colour code Determine the value of capacitor by using colour code Determine the input and output voltage of a given transformer 	6
2.	Measure electrical quantities and test electronic components	<ul style="list-style-type: none"> Measuring instruments – Multi-meter analog and digital, Cathode Ray Oscilloscope (CRO), Measurement of AC, DC voltage and current using multi-meter Measurement of AC, DC voltage and current using CRO Measurement of frequency and time period using CRO Testing of electronic component using CRO 	<ul style="list-style-type: none"> Measure the given AC, DC voltage and current by using analog multi-meter Measure the given AC, DC voltage and current by using digital multi-meter Measure the given AC, DC voltage and current using CRO Measure the frequency and time period of the given input by using CRO Test electronic component using CRO 	6
3.	Describe and test semiconductor diode	<ul style="list-style-type: none"> Concept of semiconductor PN Junction diode Forward and reverse bias characteristics of PN junction diode Testing of PN junction diodes using multimeter Specialised diodes such as zener diode, schottky diode, light emitting diode, photo diode, thermistor 	<ul style="list-style-type: none"> Draw the symbol of PN junction diode and determine the name of terminals by observing the PN junction diode Test the continuity of given diode using multimeter Construct the circuit for forward and reverse bias of the diode and draw its characteristic curve Draw the characteristics curve of zener diode, schottky diode, light emitting diode, photo diode and thermistor 	5
4.	Identify and test the transistor and	<ul style="list-style-type: none"> Bipolar junction transistors Field effect transistors 	<ul style="list-style-type: none"> Draw the symbols of NPN and PNP bipolar transistors 	8

	transistor amplifier	<ul style="list-style-type: none"> • Transistor biasing • Transistor amplifier • CE, CB and CC amplifiers • Power amplifier • Oscillators • Multi vibrators 	<ul style="list-style-type: none"> • Draw the symbols of Field Effect Transistors • Identify Base, Emitter and Collector terminals of the given transistor using multimeter • Test the continuity of given transistor by using multimeter • Demonstrate the saw tooth oscillators circuit and observe waveform on CRO • Demonstrate astable, mono-stable, and bi-stable multi-vibrator circuit using kit and observe their waveform in CRO 	
5.	Construct the circuit for rectifier and power supply	<ul style="list-style-type: none"> • Rectifiers, half wave and full wave rectifiers • Regulated power supply using zener diode 	<ul style="list-style-type: none"> • Draw the waveform of half wave rectifier and construct the circuit, measure input and output voltage • Draw the waveform of full wave rectifier and construct the circuit, measure input and output voltage • Draw the waveform of regulated power supply using zener diode and measure input and output voltage 	4
6.	Identify and test the integrated circuits (IC)	<ul style="list-style-type: none"> • Integrated Circuits (IC) • Classification of Integrated Circuits • Parameters of Integrated Circuits 	<ul style="list-style-type: none"> • List the different parameters for the given IC by using IC manual/ data sheet • Test the pins of IC using multimeter 	3
7.	Test the IC of various logic gates	<ul style="list-style-type: none"> • Introduction to digital electronics • Number systems, logic gates, arithmetic circuits, • Half adder, full adder 	<ul style="list-style-type: none"> • Convert the given decimal number into binary, octal and hexadecimal numbers • Construct the circuit for AND, OR and NOT gate and verify its truth table • Construct the circuit for half adder and full adder and verify its truth table 	4
8.	Construct the electric circuit using transducer	<ul style="list-style-type: none"> • Concept of transducer • Classification of transducer • Thermocouple transducer – NTC, PTC • Inductive transducer • Capacitive transducer 	<ul style="list-style-type: none"> • Identify the type of transducer • Construct the circuit by using thermocouple and thermistor and observe how temperature is converted into voltage • Construct the circuit by using 	4

		<ul style="list-style-type: none"> • Microphone and loudspeaker 	microphone and loudspeaker and observe how sound is converted into electric signals	
			Total Duration in Hours	40

Unit 3: Washing Technology

Sn	Learning Outcome	Theory (7 Hours)	Practical (8 Hours)	15 Hrs
1.	Describe the washing technology	<ul style="list-style-type: none"> • Washing technology – automatic and semi-automatic, • Washing of cloths – detection of type of cloths, water level sensor and indicator • Detergent type and its quantity, • Automatic use of detergent for washing of cloths, • Time setup technology, different options for setting of timer for the different types of cloths. 	<ul style="list-style-type: none"> • Identify automatic and semi-automatic washing machine, • Demonstrate the functioning of compressor • Identify and list the types of detergent for different types of cloths, • Demonstrate to fill detergent in washing machine, • Demonstrate to setup timer in digital control panel of automatic washing machine. 	5
2.	Describe the motion technology	<ul style="list-style-type: none"> • Motions technology – concepts and application, • Different types of motion – pulsator, agitator within the drum, Impeller in the drum. 	<ul style="list-style-type: none"> • Demonstrate the motion of drum in washing machine assemble, • Demonstrate the role of agitator in the drum, • List the features of motion technology 	5
3.	Demonstrate inverter and direct drive technology in washing machine	<ul style="list-style-type: none"> • Technology for low vibrations of machines, • Technology for better cleaning of cloths as like that of human beings, • Technology for cleaning of washing machines, 	<ul style="list-style-type: none"> • Illustrate the concept of low vibrations in inverter and direct drive technology, • Differentiate washing process in washing machine with manual washing process, • Demonstrate to clean the washing machine. 	5
			Total Duration in Hours	15

Unit 4: Installation of Washing Machine

Sn	Learning Outcome	Theory (20 Hours)	Practical (40 Hours)	60 Hrs
1	Describe the washing process	<ul style="list-style-type: none"> • Washing process – concept of washing, Application, 	<ul style="list-style-type: none"> • Illustrate the washing process • Observe the washing process 	7

		<ul style="list-style-type: none"> • Concept of circular motion, forces used in circular motion, • Centripetal force, centrifugal force, • Working principle of washing machine 	<ul style="list-style-type: none"> • in washing machine, • Perform the experiment to observe the centripetal force, • List the applications of centrifugal force, • Observe the washing process in washing machine, 	
2	Describe the gears and switches in washing machine	<ul style="list-style-type: none"> • Basics of gear, behaviour of gear mechanics, understanding of linear and angular movement, concept of rpm and torque • Types of switches such as thermal, mechanical, electronic, magnetic, electromagnetic, electro mechanical, pressure optical, bimetal 	<ul style="list-style-type: none"> • Demonstrate the role of gear system in washing machine, • Demonstrate speed measurement (rpm) of gears using tachometer • Identify the switches and their functions in washing machine, 	10
3	Demonstrate the washing machine assembly	<ul style="list-style-type: none"> • Different types of washing machine – automatic, semi-automatic, front load, top load • Parts of washing machine – drum, spin motor, wash motor, dryer, valve strainer, feel hose, drain line, pressure tube, water valve, pressure sensor, service panel, lead switch, temperature selector switch, water level control switch, timer, transformer, pulley and belt system, motor starting switch, drive assembly, drain cock, break assembly • Washing machine stand and other accessories • Different features and functionality of various models of washing machine 	<ul style="list-style-type: none"> • Demonstrate the different types of washing machine, • List the distinguishing features of different models of washing machine, • Identify and name the parts of washing machine, • Read the specifications of various parts of washing machine, • Draw the connectivity diagram of various components in washing machine, • Draw the line diagram of washing cycle and electrical wiring diagram, 	15
4	Use basic tools and equipment	<ul style="list-style-type: none"> • Tools for installation – screw driver, box spanner and open ended spanner, pipe cutter for installation, clamp meter, pliers, wrenches, pressure gauge, tachometer, electrical drill, tube bender, hacksaw cutter, installation manual, wiring 	<ul style="list-style-type: none"> • Demonstrate the use of basic hand tools • Demonstrate the continuity testing, resistance, voltage and current testing using clamp meter, • Demonstrate to check the motor winding using continuity 	10

		<ul style="list-style-type: none"> accessories, electrical drill, spring removal tool, T20 torx tool (star) Working knowledge of plumbing and connectivity of water tap to the machine 	<ul style="list-style-type: none"> tester, Check the water pressure using pressure gauge in the inlet pipe, Carry out the required plumbing work for installation of washing machine, 	
5	Install the washing machine	<ul style="list-style-type: none"> Site preparation, Unpacking washing machine, Checking the components, Placing washing machine, Installation setup, Fix different parts Accessories of washing machine – spin cap, washing machine stand and trolley 	<ul style="list-style-type: none"> Check functionality of all the parts – spin motor, wash motor, drum, control panel, timer, pulley and belt system, Check the proper earthing in the power supply Check the required input voltage in power socket using multimeter or clamp meter, Check for any water leakage in the inlet pipe. 	12
6	Complete post installation procedure	<ul style="list-style-type: none"> Controls provided in washing machine Check functionality of all the parts of Washing machine Energy efficiency rating of Washing machine Function of the Washing machine to the customer Post installation documents and records Packaging based disposal procedure 	<ul style="list-style-type: none"> Draw the diagram showing the controls provided in the washing machine, Demonstrate the functionality of all parts of washing machine to the customer, Read energy efficiency rating of washing machine Fill online warranty of product Demonstrate the procedure to claim the warranty online Demonstrate to install additional accessories 	6
Total Duration in Hours				60

Unit 5: Workplace Safety Measures

Sn	Learning Outcome	Theory (10 Hours)	Practical (10 Hours)	20 Hrs
1	Observe electrical and safety measures	<ul style="list-style-type: none"> Electrical earthing Different hazards related to installation and repair of refrigerator Safety guidelines while installation and repair of refrigerator Workplace safety policies and general guidelines 	<ul style="list-style-type: none"> Demonstrate to check electrical earthing Identify and list different hazards related to installation and repair of refrigerator List and use the organisational safety guidelines while installation and repair of refrigerator 	5

2	Use proper personal protective equipment (PPE)	<ul style="list-style-type: none"> Electrical safety guidelines by using proper personal protective equipment (PPE) 	<ul style="list-style-type: none"> Demonstrate the use of proper personal protective equipment (PPE) for electrical safety 	7
3	Use safety and protection equipment	<ul style="list-style-type: none"> Safety and protection equipment such as fire extinguisher, safety instrument and clothing Basic first aid Types of accident injury or hazard 	<ul style="list-style-type: none"> Demonstrate the use of safety and protection equipment Demonstrate the use of first aid to provide the basic first aid Identify and report any accident injury or hazard 	8
Total Duration in Hours				20

CLASS 12

Part A: Employability Skills

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

Unit 1: Communication Skills – IV

Sn	Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	25 Hrs
1.	Describe the steps to active listening skills	<ul style="list-style-type: none"> Importance of active listening at workplace Steps to active listening. 	<ul style="list-style-type: none"> Demonstration of the key aspects of becoming active listener. Preparing posters of steps for active listening. 	10
2.	Demonstrate basic writing skills	<ul style="list-style-type: none"> Writing skills to the following: <ul style="list-style-type: none"> Sentence Phrase Kinds of Sentences Parts of Sentence Parts of Speech Articles Construction of a Paragraph 	<ul style="list-style-type: none"> Demonstration and practice of writing sentences and paragraphs on topics related to the subject. 	15
Total Duration in Hours				25

Unit 2: Self-management Skills – IV

Sn	Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	25 Hrs
1.	Describe the various factors influencing self-motivation	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Group discussion on identifying needs and desire. Discussion on sources of motivation and inspiration. 	10
2.	Describe the basic personality traits, types and disorders	<ul style="list-style-type: none"> Describe the meaning of personality. Describe how personality influence others. Describe basic personality traits. Describe common personality disorders- paranoid, antisocial, schizoid, borderline, narcissistic, avoidant, dependent and obsessive. 	<ul style="list-style-type: none"> Demonstrate the knowledge of different personality types. 	15
			Total Duration in Hours	25

Unit 3: Basic ICT Skills – IV

Sn	Learning Outcome	Theory (06 Hours)	Practical (14 Hours)	20 Hrs
1.	Perform tabulation using spreadsheet application	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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, Copy 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 	10

			various formats.	
2.	Prepare presentation using presentation application	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Demonstration and practice on the following: • List the software packages with features for 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. 	10
			Total Duration in Hours	20

Unit 4: Entrepreneurial Skills – IV

Sn	Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	25 Hrs
1.	Identify the general and entrepreneurial behavioural competencies	<ul style="list-style-type: none"> • Barriers to becoming entrepreneur. • Behavioural and entrepreneurial competencies – adaptability/decisiveness, initiative/perseverance, interpersonal skills, organizational skills, stress management, valuing service and diversity. 	<ul style="list-style-type: none"> • 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 behavioural competencies. • Preparation of competency profile of students. 	10
2.	Demonstrate the knowledge of self-assessment of behavioural competencies	<ul style="list-style-type: none"> • 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, team building. 	<ul style="list-style-type: none"> • Games and exercises on changing entrepreneurial behaviour and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and creativity. 	15
			Total Duration in Hours	25

Unit 5: Green Skills – IV

Sn	Learning Outcome	Theory (05 Hours)	Practical (10 Hours)	15 Hrs
1.	Identify the role and importance of green jobs in different sectors	<ul style="list-style-type: none"> • 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 in appropriate technology. • Role of green jobs in Improving energy and raw materials use • Role of green jobs in limiting greenhouse gas emissions • 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 	<ul style="list-style-type: none"> • Listing of green jobs and preparation of posters on green job profiles. • Prepare posters on green jobs. 	15
			Total Duration in Hours	15

Class XII, Part B: Vocational Skills

Unit No.	Unit Name	Duration in Hours
Unit 1	Repair and Maintenance of Washing Machine	75
Unit 2	Troubleshooting IoT applications in Washing Machine	50
Unit 3	Advanced Technologies in Washing Machine	20
Unit 4	Workplace Safety Measures	20
	Total Duration	165

Unit 1: Repair and Maintenance of Washing Machine

Sn	Learning Outcome	Theory (30 Hours)	Practical (45 Hours)	75 Hrs
1.	Identify and check the faults in washing machine	<ul style="list-style-type: none"> Preventive maintenance of washing machine – cleaning drum, drain out pipe, outer body, Fault finding using customer interaction, initial inspection, symptom, history of problem, age of appliance, Process for checking the components of washing machine like motor, pulley, belt, control panel, gear system, switches. 	<ul style="list-style-type: none"> Demonstrate the preventive maintenance of washing machine, List and resolve the common faults in washing machine, Check the various components of washing machine using continuity tester. Components – motor, pulley, belt, control panel, gear system, switches. Check the timer, sensor, buzzer, power supply in the washing machine. 	15
2	Attempt common problem in electrical system of washing machine	<ul style="list-style-type: none"> Common electrical problems – basic electrical faults such as improper earthing, defective power chord, connector or internal wiring defect, short or open electrical contacts, blown fuse, defective transformer, reason for no electric display on the window, defect in the motor and motor capacitor when symptoms such as noise, defective sensor, buzzer. 	<ul style="list-style-type: none"> Demonstrate to replace wash motor and spin motor, Demonstrate the preventative maintenance of motors, Demonstrate to replace high voltage capacitor in washing machine, Perform the earthing test in the control panel of the washing machine, Demonstrate to resolve other common problems in electrical system of washing machine. 	20
3	Attempt common problem in mechanical system of washing	<ul style="list-style-type: none"> Common mechanical problems – Water leakage and pulsator not rotating, fault in the mechanical system such as 	<ul style="list-style-type: none"> Demonstrate the replacement of gear box in the washing machine, Demonstrate the replacement 	20

	machine	gear box assembly, broken belt, loose screw, leakage or choke in pressure tube, defective feed valve, other faults, water not feeling, over-feeling, water not draining.	of belt and pulley in the washing machine, <ul style="list-style-type: none"> • Demonstrate the cleaning procedure of pulsator, • Demonstrate to dismantle wash tub and spin tub, • Demonstrate the replacement of drain pipe. 	
4	Use tools and test equipment for repairing	<ul style="list-style-type: none"> • Testing equipment – clamp meter, pressure gauge, flexible charging line, electric drill machine, • Tools for repair and servicing - Putty knife, Wrench set, Nut driver set, Tub Nut Wrench, Bearing and seal tool, Spring Removal Tool, T-20 Torx (star) Bot spanner, rake removal tool, Coupler removal tool, Wiring accessories, Tube cutter, Round nose plier, Flaring tool, Brazing torch, adjustable wrench, Allen key, Flat file, Round file, gauge manifold, Tube cutter, 	<ul style="list-style-type: none"> • Demonstrate to use screw driver to dismantle the washing machine, • Demonstrate the discharging of high voltage capacitor using round nose plier, • Demonstrate to measure power supply and electric current using clamp meter, • Demonstrate to measure water pressure in the inlet pipe using pressure gauge, • Demonstrate the use of adjustable wrench for inlet water pipe fitting, • Remove the belt of pulley. 	15
5	Perform post repair tasks	<ul style="list-style-type: none"> • Check the functionality of washing machine after repairing, • Aware the customer about working of washing machine, • Documentation and payments, • Knowledge about the warranty, model, replacement cost. 	<ul style="list-style-type: none"> • Demonstrate the checking of functionality of washing machine after repair and take customer feedback, • Prepare invoice of billing, • Fill the online feedback of customer. 	5
Total Duration in Hours				75

Unit 2: Troubleshooting IoT applications in Washing Machine

Sn	Learning Outcome	Theory (20 Hours)	Practical (30 Hours)	50 Hrs
1	Identify common problem related to IoT applications	<ul style="list-style-type: none"> • Common problem in IoT application • List of error codes of related issues 	<ul style="list-style-type: none"> • Demonstrate the troubleshooting of the product through mobile app • Prepare a chart of error codes their cause and remedies 	15
2	Troubleshoot to	<ul style="list-style-type: none"> • Software issues - Internet 	<ul style="list-style-type: none"> • Identify the issue and rectify 	15

	resolve IoT software issues	<p>connection, Wi-Fi, Bluetooth version compatibility</p> <ul style="list-style-type: none"> • Troubleshooting software issues • Steps to resolve software issues • Software setting - Update software and network setting 	<p>the faulty sensor and circuit board</p> <ul style="list-style-type: none"> • Demonstrate to update the software. • Demonstrate the network setting in the installed software • Identify and list the different cables and connectors use in the network connectivity 	
3	Troubleshoot to resolve IoT hardware issues	<ul style="list-style-type: none"> • Hardware issues - IoT circuit board, sensor, power connection, network cables • Steps for troubleshooting hardware issues • Steps to replace the faulty sensor and circuit board 	<ul style="list-style-type: none"> • List the common hardware issues • Troubleshoot the common hardware issues • Check and replace the faulty sensor and circuit board 	10
4	Ensure the functionality using mobile app	<ul style="list-style-type: none"> • Mobile app for checking the functionality • Various functions in mobile app • Troubleshooting through mobile app 	<ul style="list-style-type: none"> • Checking the functionality using mobile app • Demonstrate the washing machine control using mobile app 	10
			Total Duration in Hours	50

Unit 3 : Advanced Technologies in Washing Machine

Sn	Learning Outcome	Theory (10 Hours)	Practical (10 Hours)	20 Hrs
1.	Demonstrate the connectivity of washing machine to Internet	<ul style="list-style-type: none"> • Internet technology • Internet of things (IoT) technology • Controlling washing machine using smart phone Apps • Use of micro controller and sensors • Fuzzy logic technology 	<ul style="list-style-type: none"> • Establish the device connectivity to the wireless network using Internet technology • Demonstrate the different functionalities of App • Demonstrate the use of micro controller and sensors • Demonstrate the effect of cooling by using Fuzzy logic technology 	10
2.	Describe the advanced technology in washing machine	<ul style="list-style-type: none"> • Improved drum technology and motion technology, • Cleaning with bubbles technology, • Anti vibration technology, • Digital inverter and direct drive to increase efficiency of washing machine, 	<ul style="list-style-type: none"> • List various advanced technologies and their advantages • Demonstrate the features of drum and motion technology, cleaning with bubbles technology, anti vibration technology, digital inverter 	10

		<ul style="list-style-type: none"> Smart control of washing machines using sensors, washing machine with built in heaters Auto dispenser to solve the dilemma of correct quantity of detergent, conversion of the hard water into soft water technology 	and direct drive technology	
			Total Duration in Hours	20

Unit 4: Workplace Safety Measures

Sn	Learning Outcome	Theory (8 Hours)	Practical (12 Hours)	20 Hrs
1.	Observe the basic safety	<ul style="list-style-type: none"> Safe handling of detergent, Use of soft water in washing machine, Precautions in safe handling, Checking water leakage, Working posture while handling the parts of washing machine, Electrical safety while repairing. 	<ul style="list-style-type: none"> Demonstrate the safe handling of detergent, List the precautionary measures needed for safe handling of washing machine, Practice the safer working posture while handling the parts of washing machine, Practice electrical safety while repairing. 	12
2.	Handle the tools safely	<ul style="list-style-type: none"> Procedure for safety handling of tools – screw driver, pipe wrench, nose plier, wire cutter, wire stripper, phase tester Procedure for safety handling of equipment – clamp meter, multimeter, pressure gauge. 	<ul style="list-style-type: none"> Demonstrate the safe handling of tools, Demonstrate the safe handling of equipment. 	8
			Total Duration in Hours	20

6. ORGANISATION OF FIELD VISITS

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

Visit a Washing Machine service centre and observe the following: Location, Site, Parts of Washing Machine, Plumbing work required for installation of Washing Machine. During the visit, students should obtain the following information from the owner or the supervisor :

1. Washing Machine brands, types, capacity, star ratings,
2. Washing Machine parts, wires, primary unit, secondary unit,
3. Specifications of various Washing Machine and their parts,
4. Comparison of various brands, models,
5. Energy consumption for various star ratings,

6. Reading the specifications of each part,
7. Comparison of various parts based on cost,
8. Tools and equipment required for installation, repair and maintenance,
9. Cost benefit analysis to purchase Washing Machine,
10. Advanced technology in Washing Machine.

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	Equipment	Material
<ul style="list-style-type: none"> • Phase tester • Screwdriver set • Nut driver set • Combination Plier • Spanner set • Electrical tape • Soldering kit • Flaring tool • Tube Bender • Tube cutter • Wire gauge • Drill machine • Measuring tape • Pipe cutter • Hacksaw • Hammer • Scissor • Peltzier • Flat file • Round file • Allen wrench • Adjustable wrench • Yoke vise • Brazing tool • Weight scale • T-20 Torx tool (star) • Putty knife • Spring removal tool 	<ul style="list-style-type: none"> • Cathode Ray Oscilloscope(CRO) • Multimeter • Clamp-meter • Pressure gauge • Brazing torch • Personal Protective Equipment • Fire Extinguisher • Wi-Fi • Bluetooth • Leak Detector • Manifold Gauge • Continuity Tester • Pressure Gauge • Tachometer 	<ul style="list-style-type: none"> • Electrical and electronic components: Resistor, capacitor, inductor, various diode, Bipolar Junction Transistor, transformer, starter, relay, contractor, Field Effect Transistor (FET), Integrated Circuit, Circuit breaker • Wiring layout • Colour code chart of resistor • Code chart of capacitor • Data sheet of Integrated Circuit • Astable, Monostable, Bistable Multivibrator kit • First aid kit • Wire • Ohm's Law kit • Kirchhoff's Law kit • AC and DC motors • Regulated power supply kit • Error Code chart for IoT • Internet connection • Network cable • Printed Circuit Board • Microcontroller • Sensor • Smart phone • Condenser

8. TEACHER'S/TRAINER'S QUALIFICATION

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:

Qualification	Minimum Competencies	Age Limit
Bachelor of Engineering / Technology in Electrical/ Electronics OR Master of Science in Electronics/ Electrical. It is recommended to have the specialised qualification in Washing Machine Technology.	The candidate should have a minimum of 1 year of work experience in the same job role. S/ He should be able to communicate in English and local language. S/He should have knowledge of equipment, tools, material, Safety, Health & Hygiene.	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 following ways:

1. 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**
2. 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:

1. Written test for the technical/domain specific knowledge related to the sector;
2. Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
3. 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:

- 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 organise 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 counselling 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;
- Organisation of activities for promotion of vocational subjects;
- Involvement in placement of students/student support services.

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