LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE:
Wireman: Control Panel
(QUALIFICATION PACK: Ref. Id. ELE/Q7302)
Sector: Electronics
Classes 11 and 12

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
Shyamla Hills, Bhopal – 462 002, M.P., India
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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LEARNING OUTCOME BASED CURRICULUM
Wireman Control Panel
Electronics Sector

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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 – Wireman Control Panel**. 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 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 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 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 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 courseware 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 courseware to the States and other stakeholders under the PAB (Project Approval Board) approved project of *Rashtriya Madhyamik Shiskha 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 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

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 Gaurav Kathel and Dipak 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 Dipak Shudhalwar, Associate Professor (CSE) and Head, Computer Centre, PSSCIVE in development of the curriculum for the employability skills are duly acknowledged.

We are also grateful to the Course Coordinator Dipak D. Shudhalwar, Associate Professor (CSE) and Head Computer Center, PSSCIVE, for bringing out this curriculum in the final form.

PSSCIVE Team

CONTENTS

1. COURSE OVERVIEW

COURSE TITLE: Wireman Control Panel

Wireman Control Panel is aimed at training candidates for the job of a "Wireman – Control Panel", in the "Electronics" Sector, "Industrial Electronics" Sub-Sector and aims at building the key competencies in Wireman Control Panel.

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

- ✓ Apply effective oral and written communication skills to interact with people and customers;
- ✓ Identify the principal components of a computer system;
- ✓ Demonstrate the basic skills of using computer;
- ✓ Demonstrate self-management skills;
- ✓ Demonstrate the ability to provide a self-analysis in context of entrepreneurial skills and abilities;
- ✓ Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
- ✓ Identify the different types of control panels in residential and commercial power systems
- ✓ Demonstrate the wiring of simple control panels
- ✓ Identify and rectify/repair the faults in house wiring connection with grid
- ✓ Ensure system functioning and perform a demo
- ✓ Handle queries.
- ✓ Identify and control hazards in the workplace that pose a danger or threat to their safety or health, or that of others.

COURSE REQUIREMENTS: The learner should have the basic reading and writing skills in English and Hindi.

COURSE LEVEL: This is a beginner level course meant for class 11 and 12.

COURSE DURATION: **400 Hours**
Class 11: 200 hrs
Class 12 : 200 hrs

2. SCHEME OF UNITS AND ASSESSMENT

This course is a planned sequence of instructions consisting of Units meant for developing employability and vocational competencies of students of Class 9 and 10 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 200**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1: Communication Skills	20	**10**
	Unit 2: Self-management Skills	10	
	Unit 3: Basic ICT Skills	25	
	Unit 4: Entrepreneurial Skills	15	
	Unit 5: Green Skills	10	
	Total	**80**	**10**
Part B	**Vocational Skills**		
	Unit 1: Basics of electrical and electronics	30	**30**
	Unit 2: Electrical and electronic components	20	
	Unit 3: Component identification	40	
	Unit 4: Earthing		
	Unit 5: Cable		
	Unit 6: Electrical safety		
	Unit 7: Tools and equipment		
	Unit 8: Electromechanical assembly		
	Unit 9: Wire preparation		
	Unit 10: Electrical Hazard		
	Total	**90**	**30**
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**
Part E	**Continuous and Comprehensive Evaluation (CCE)**	**05**	**10**
	Total Hours	**200**	**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 200**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1: Communication Skills	20	**10**
	Unit 2: Self-management Skills	10	
	Unit 3: Basic ICT Skills	25	
	Unit 4: Entrepreneurial Skills	15	
	Unit 5: Green Skills	10	
	Total	**80**	**10**
Part B	**Vocational Skills**		
	Unit 1: Role of a Wireman	25	**10**
	Unit 2: Wiring a Control Panel	45	
	Unit 3: Safety Precautions for Electrical Work	20	
	Total	**90**	**30**
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**
Part E	**Continuous and Comprehensive Evaluation (CCE)**	**05**	**10**
	Total Hours	**200**	**100**

3. TEACHING/TRAINING ACTIVITIES

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

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

CLASSROOM ACTIVITIES

Classroom activities are an integral part of this course and interactive lecture sessions, followed by discussions should be conducted by trained vocational teachers. Vocational teachers should make effective use of a variety of instructional 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 competency.

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**

		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)	**2**	**1**	**2**	**10**
2.	Understanding – (Comprehension – to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	**1**	**2**	**2**	**11**
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**	**1**	**1**	**05**
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**	**1**	**0**	**02**
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	**3x1=3**	**6x2=12**	**5x3=15**	**30 (14 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, 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 in Hours
1.	Unit 1: Communication Skills – I	20
2.	Unit 2: Self-management Skills – I	10
3.	Unit 3: Basic ICT Skills – I	25
4.	Unit 3: Entrepreneurial Skills – I	15
5.	Unit 4: Green Skills – I	10
	Total	**80**

Unit 1: Communication Skills – I				
S. No.	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20 Hrs**
1.	Demonstrate knowledge of various methods of communication.	• Methods of communication. • Verbal. • Non-verbal. • Visual.	• Writing pros and cons of written, verbal and non-verbal communication. • Listing do's and don'ts for avoiding common body language mistakes.	05
2.	Identify elements of communication cycle.	• Meaning of communication • Importance of communication skills • Elements of communication cycle– • (i) sender, • (ii) ideas, • (iii) encoding, • (iv) communication channel, • (v) receiver, • (vi) decoding, and • (vii) feedback	• Draw a diagram of communication cycle • Role plays on communication process related to the sector/job role.	05
3.	Identify the factors affecting our perspectives in communication	• Perspectives in communication. • Factors affecting perspectives in communication. • Visual perception. • Language. • Past experience. • Prejudices. • Feelings. • Environment.	• Group discussion on factors affecting perspectives in communication. • Sharing of experiences on factors affecting perspectives. • Sharing experiences on factors affecting communication at workplace.	05
4.	Demonstrate the knowledge of	• Writing skills related to the following:	• Demonstration and practice of writing sentences and	05

	basic writing skills	• Phrases • Kinds of sentences • Parts of sentence • Parts of speech • Use of articles • Construction of a paragraph	paragraphs on topics related to the subject.	
			Total Duration in Hours	**20**

Unit 2: Self Management Skills – I				
S. No.	**Learning Outcome**	**Theory (07 Hours)**	**Practical (03 Hours)**	**10 Hrs**
1.	Describe the meaning and importance of self-management.	• Meaning of self-management. • Positive results of self-management. • Self-management skills.	• Identification of self- • management skills • Strength and • weakness analysis.	05
2.	Identify the factors that helps in building self-confidence .	• Factors that help in building self-confidence – social, cultural, and physical factors • Self-confidence building tips - getting rid of the negative thoughts, thinking positively, staying happy with small things, staying clean, hygienic and smart, chatting with positive people, etc.	• Role play exercises on building self-confidence. • Use of positive metaphors/ words. • Positive stroking on wakeup and before going bed. • Helping others and working for community.	05
			Total Duration in Hours	**10**

Unit 3: Basic ICT Skills - I				
S.No.	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Describe the role of ICT in day-to-day life.	• Introduction to ICT • Role and importance of ICT in personal life and at workplace • ICT in our daily life (examples) • ICT tools – Mobile, tab, radio, TV, email, etc.	• Discussion on the role and importance of ICT in personal life and at workplace. • Preparing posters / collages for showing the role of ICT at workplace	02
2.	Identify the various components of computer system	• Basic components of computer system. • Hardware and software. • Primary and secondary memory. • Input, Output and Storage devices.	• Identify and name the various components of computer system. • List few hardware and software. • Identify and name the primary and secondary memory. • Identify the various Input, Output and Storage devices.	05
3.	Identify various peripheral devices	• Various peripheral devices and their use. • Examples of peripherals.	• List various peripheral devices. • Give the examples of peripheral devices.	04

			• Practice using peripheral devices.	
4.	Perform basic computer operations	• Procedure for starting and shutting down a computer. • Operating Systems (OS). • Types of OS – DOS, Windows, Linux. • Desktop of Windows and Linux. • Files and folder. • Keyboard and mouse operations. • Common desktop operations.	• Start the computer in proper sequence and get the intitial screen. • Identify the installed OS on computer. • Identify the destop and its various components. • Work with desktop. • Create file and folder. • Perform keyboard and mouse operations.	06
5.	Connect with the world using Internet and its applications	• Introduction to Internet. • Applications of Internet. • Internet Browser. • Websites and webpages. • Email applications. • Email accounts. • Sending and receiving email. • Introduction to social media. • Blog. • Twitter. • Facebook. • Youtube. • WhatsApp. • Digital India.	• Introduce with Internet. • Explain the applications of Internet. • List the various Internet Browser. • Search the websites. • Create Email account. • Send and receive email. • Use Social Media for education. • Use Blog. • Use Twitter. • Use Facebook. • Use Youtube. • Use WhatsApp. • Use Digital India.	08
			Total Duration in Hours	**25**

Unit 4: Entrepreneurial Skills – I				
S. No.	**Learning Outcome**	**Theory (06 Hours)**	**Practical (09 Hours)**	**15 Hrs**
1.	Identify various types of business activities	• Types of businesses – service, manufacturing, hybrid. • Types of businesses found in our community Business activities around us.	• Prepare posters of business activities found in cities/ villages, using pictures. • Discuss the various types of activities, generally adopted by small businesses in a local community. • Best out of waste. • Costing of the product made out of waste. • Selling of items made from waster materials. • Prepare list of businesses that provides goods and services in exchange for money.	09
2.	Demonstrate the knowledge of	• Meaning of entrepreneurship development.	• Prepare charts showing advantages of	06

	distinguishing characteristics of entrepreneurship	• Distinguishing characteristics of entrepreneurship. • Role and rewards of entrepreneurship.	entrepreneurship over wages. • Group discussions on role and features of entrepreneurship. • Lectures/presentations by entrepreneurs on their experiences and success stories. • Identify core skills of successful entrepreneur.	
			Total Duration in Hours	**15**

Unit 5: Green Skills – I				
S. No.	**Learning Outcome**	**Theory (03 Hours)**	**Practical (07 Hours)**	**10 Hrs**
1.	Demonstrate the knowledge of the factors influencing natural resource conservation.	• Introduction to environment. • Relationship between society and environment, ecosystem and factors causing imbalance. • Natural resource conservation. • Environment protection and conservation.	• Group discussion on hazards of deteriorating environment. • Prepare posters showing environment conservation. • Discussion on various factors that influence our environment.	05
2.	Describe the importance of green economy and green skills.	• Definition of green economy • Importance of green economy	• Discussion on the benefits of green skills and importance of green economy. • Prepare a Poster showing the importance of green economy with the help of newspaper/ magazine cuttings.	05
			Total Duration in Hours	**10**

Part B: Vocational Skills

S. No.	**Units**	**Duration in Hours**
1.	Unit 1: Basics of electrical and electronics	30
2.	Unit 2: Electrical and electronic components	20
3.	Unit 3: Component identification	40
4.	Unit 4: Earthing	
5.	Unit 5: Cable	
6.	Unit 6: Electrical safety	
7.	Unit 7: Tools and equipment	
8.	Unit 8: Electromechanical assembly	

9.	Unit 9: Wire preparation	
10.	Unit 10: Electrical Hazard	
	Total Duration	**90**

Unit 1: Basics of electrical and electronics				
S. No.	**Learning Outcome**	**Theory (12 Hours)**	**Practical (12 Hours)**	**30 Hrs**
1.	Electricity	1. Source of Electricity 2. Type of Electricity 3. Current 4. Voltage 5. Electric power 6. Power Factor 7. Classification of current • Direct Current • Alternating Current	• Measure the voltage and current of basic resistive circuits using ammeter and voltmeter. • Make basic electrical circuit with passive components and measure voltage, current and resistance using multimeter.	10
2.	Basic concept and laws of electricity	• Series and parallel circuits • Ohms law • Kirchhoff's voltage law • Kirchhoff's current law	• Prepare the circuit and verify ohm's law. • Prepare the circuit and verify Kirchhoff's law. • Preparation of series and parallel circuit using resistor.	10
			Total Duration in Hours	**30**

Unit 2: Electrical and electronic components				
S. No.	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20 Hrs**
1.	Basic electrical and electronic components	• Resistor • Capacitor • Inductor • Diode • Transistor • Transformer • Integrated circuit • Light emitting diode	• Identify the various electrical and electronic components. • Draw symbols of various electrical components. • Make basic electrical circuit with passive	10

			components and measure voltage, current and resistance using multimeter.	
			Total Duration in Hours	**20**

Unit 3: Component identification				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
1.	Identification of components	• Identification of resistor • Colour Coded Resistors (Axial Resistors) • Specification of Four Band Resistor • Calculation of resistor value • Alphanumerically Coded Resistors (Surface Mounted Resistors) • Identification of capacitor • Reading a Capacitor • Measuring unit of capacitor • Read the capacitance value • Tolerance value of capacitor • Voltage rating of capacitor	• Identify the various components of a control panel • Identify the cables used in a control panel • List the tools and equipment used for a control panel	10
			Total Duration in Hours	**40**

Unit 4: Earthing				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
	Explain the importance of earthing system and protection	• Earthing importance and types: pipe earthing, plate earthing and rod earthing • Importance of lightning	• Visit the site and observe the different types of earthing systems. • Identify and list different types	10

	devices	arrester • Surge protection devices and circuit breakers	of circuit breakers and surge protection devices	
			Total Duration in Hours	**40**

Unit 5: Cable				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
1	Cable	• Fundamental of cable • Types of cable • Identification of cable • Cable preparation methods • Tools used for cable preparation	• Crimping of cable • Study of different tools used for cabling	10
			Total Duration in Hours	**40**

Unit 6: Electrical Safety				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
	Electrical safety	• Safety in electrical system • Work and Safety Standards • Protecting Yourself • Electrostatic Discharge (ESD) • Safety measures to prevent electric shock • Electrical earthing for safety	• Identification of MCB • Identification of different safety symbol • Study safety measure for ESD • Use of different safety material and equipments	10
			Total Duration in Hours	**40**
Unit 7: Tools and equipments				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
	Tools and equipment	• Multimeter • Screwdriver • Clampmeter • Wire stripper • Pleir	• Measurement of AC and DC voltage using multimeter • Measurement of AC and DC current using	10

		• Phase tester • Hammer • Ladder	multimeter • Measurement of current using clampmeter • Study of different tools and parts of different tools	
			Total Duration in Hours	**40**

Unit 8: Electromechanical Assembly				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
	Electromechanical Assembly	• Electromechanical system • Components of electromechanical Assembly • Types of assembly • Wiring instruction and guidelines for assembly • Panel assembly steps	• Identification of electromechanical assembly • Identification of different types of assemblies • Study the general guidelines for wiring	10
			Total Duration in Hours	**40**

Unit 9: Wire preparation				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**
	Wire preparation	• Wire preparation steps • Cable stripper, cable stripping operation • Damage during insulation removal • General principle of wiring and stripping of wire • Wire bending, Wire joints • Crimping, crimping tools • Lugs • Cable preparation	1. Perform the crimping for 70mm four core power cable. 2. Perform the crimping for 2.5mm wire 3. Perform the steps of checking the oil level of hydraulic crimping tool	10
			Total Duration in Hours	**40**

Unit 10: Electrical hazard				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (20 Hours)**	**40Hrs**

	Electrical hazard	• Handling of Heavy and Hazardous Materials • Maintaining Correct Posture while Working • Preventing Electric Shock at workplace • Preventing Electric Shock on the Job • Preventing Electric Shock in a Lightning Storm • Fire Extinguisher • Basic First Aid • Artificial Respiration • Electrical Emergencies	• Demonstration of fire extinguisher use. • Steps for opening the knob of fire extinguisher • Study of basic first aid steps.	10
			Total Duration in Hours	**40**

CLASS 12

Part A: Employability Skills

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills	20
2.	Unit 2: Self-management Skills	10
3.	Unit 3: Basic ICT Skills	25
4.	Unit 4: Entrepreneurial Skills	15
5.	Unit 5: Green Skills	10
	Total	**80**

Unit 1: Communication Skills – II

S. No.	Learning Outcome	Theory (12 Hours)	Practical (08 Hours)	20 Hrs
1.	Demonstrate knowledge of various methods of communication.	• Methods of communication • Verbal. • Non-verbal. • Visual.	• Writing pros and cons of written, verbal and non-verbal communication • Listing do's and don'ts for avoiding common body language mistakes	04
2.	Provide descriptive and specific feedback.	• Communication cycle and importance of feedback. • Meaning and importance of feedback. • Descriptive feedback - written comments or conversations. • Specific and non-specific feedback.	• Constructing sentences for providing descriptive and specific feedback.	04
3.	Apply measures to overcome barriers in communication.	• Barriers to effective communication – types and factors. • Measures to overcome barriers in effective. Communication.	• Enlisting barriers to effective communication. • Applying measures to overcome barriers in communication.	04
4.	Apply principles of communication.	• Principles of effective communication. • 7 Cs of effective communication.	• Constructing sentences that convey all facts required by the receiver. • Expressing in a manner that shows respect to the receiver of the message • Exercises and games on applying 7Cs of effective communication.	04
5.	Demonstrate basic writing skills.	• Writing skills to the following: • Sentence • Phrase • Kinds of Sentences	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject.	04

		• Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph.		
			Total Duration in Hours	**20**

Unit 2: Self-management Skills – II				
S. No.	**Learning Outcome**	**Theory (05 Hours)**	**Practical (05 Hours)**	**10 Hrs**
1.	Apply stress management techniques	• Meaning and importance of stress management • Stress management techniques – physical exercise, yoga, meditation • Enjoying, going to vacations and holidays with family and friends • Taking nature walks	• Exercises on stress management techniques – yoga, meditation, physical exercises. • Preparing a write-up on an essay on experiences during a holiday trip.	04
2.	Demonstrate the ability to work independently	• Importance of the ability to work independently. • Describe the types of self-awareness. • Describe the meaning of self-motivation and self-regulation.	• Demonstration on working independently goals. • Planning of an activity Executing tasks in a specific period, with no help or directives. • Demonstration on the qualities required for working independently.	06
			Total Duration in Hours	**10**

Unit 3: Basic ICT Skills – II				
S. No.	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Prepare documentation using Word Processing Application	• Introduction to word processing. • Software packages for word processing. • Opening and exiting the word processor. • Creating a document. • Saving document. • Text editing. • Word wrap and alignment. • Font size, type and face. • Header and Footer. • Auto Correct. • Numbering and Bullet. • Creating Table. • Password protection. • Printing document.	• List the features of word processing. • List the software packages for word processing. • Open and exit the word processor. • Create a document. • Edit the text. • Wrap and align the text. • Change the font type, size, and face. • Insert Header and Footer. • Use Autocorrect option. • Assign numbering and bullets to list items. • Create Table. • Save the document.	10

		• Find and Replace. • Page numbering. • Saving a document in various formats.	• Protect the document with password. • Print the document. • Use Find and Replace. • Give page numbering. • Save the document in various formats.	
2.	Perform Tabulation using Spreadsheet Application	• Introduction to spreadsheet application. • Various spreadsheet applications. • Creating a new worksheet. • Opening workbook and entering data. • Resizing fonts and styles. • Copying and moving. • Filter and sorting. • Formulas and functions. • Password protection. • Printing a spreadsheet. • Saving a spreadsheet in various formats.	• Introduce with the spreadsheet application. • List the spreadsheet applications. • Create a new worksheet. • Open the workbook and enter text. • Resize fonts and styles. • Copy and move the cell data. • Sort and Filter the data. • Apply elementary formulas and functions. • Protect the spreadsheet with password. • Print a spreadsheet. • Save the spreadsheet in various formats.	10
3.	Prepare Presentation using Presentation Application	• Introduction to presentation software . • Software packages for presentation. • Creating a new presentation. • Entering and editing text. • Adding a slide. • Deleting a slide. • Formatting text. • Inserting clipart & images. • Slide layout. • Slide transition and custom animation. • Saving a presentation. • Printing a presentation. document.	• Explain the features of presentation. • List the software packages for presentation. • Create a new presentation. • Add a slide to presentation. • Delete a slide. • Enter and edit text. • Format text. • Insert clipart & images. • Slide layout. • Save a presentation. • Print a presentation. document.	05
			Total Duration in Hours	**25**

Unit 4: Entrepreneurial Skills – II				
S. No.	**Learning Outcome**	**Theory (06 Hours)**	**Practical (09 Hours)**	**15 Hrs**
1.	List the characteristics of successful entrepreneur	• Entrepreneurship and society. • Qualities and functions of an entrepreneur. • Role and importance of an entrepreneur. • Myth about entrepreneurship.	• Writing on entrepreneurship as career option. • Collecting success stories of first generation and local entrepreneurs. • Listing the entrepreneurial	15

		• Entrepreneurship • as a career option.	qualities – analysis of strength and weaknesses. • Group discussion of self-qualities that students feel are needed to become successful entrepreneur. • Collect information and related data for a business. • Make a plan in team for setting up a business.	
			Total Duration in Hours	**15**

Unit 5: Green Skills – II				
S. No.	**Learning Outcome**	**Theory (07 Hours)**	**Practical (03 Hours)**	**10 Hrs**
1.	Demonstrate the knowledge of importance, problems and solutions related to sustainable development	• Definition of sustainable development. • Importance of sustainable development. • Problems related to sustainable development.	• Identify the problem related to sustainable development in the community. • Group discussion on the importance of respecting and conserving indigenous knowledge and cultural heritage. • Discussion on the responsibilities and benefits of environmental. citizenship, including the conservation and protection of environmental values. • Preparing models on rain water harvesting, drip / sprinkler irrigation, vermin-compost, solar energy, solar cooker, etc.	10
			Total Duration in Hours	**10**

Part B: Vocational Skills

S. No.	**Units**	**Duration in Hours**
1.	Unit 1: Role of a Wireman	25
2.	Unit 2: Wiring a Control Panel	45
3.	Unit 3: Safety Precautions for Electrical Work	20
	Total Duration	**90**

Unit 1: Role of a Wireman				
S. No.	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Evaluating the Work requirements	• Interacting with the Supervisor • Plan the task	• Plan the day's production activities based on the	05

		• Get the task done from others • Organize and control work for efficiency • Look after interpersonal issues • Manage work as per given responsibility • Handle materials correctly • Report as per schedule and maintain proper documentations • Identify ways to improve the work process	supervisor's instructions • Use wiring drawings, job instructions or work manuals • Check availability of materials required for wiring	
2.	Outline the Responsibility of a Wireman	• Listing the type of the wires and other equipment • Understanding the wiring diagram for wiring the control panel • Understanding labels and warning signs on the tools and components • Reporting any defective or inadequate component	• Collect the wires and other equipment from the store • Read and follow the wiring diagram for wiring control panel. • Read all the labels and warning signs on the tools and components. • Check all the components to ensure that they are in good working condition • Report in time any defective or inadequate component. • Return all tools and equipment to the store in the day end.	05
3.	State the organizational Context	• Maintaining Records and Fill Forms	• Follow the company's policies and rules. • Follow the reporting hierarchy. • Follow your role as defined in the work-flow. • Follow documentation process.	05
4.	Adhering to Health and Safety Norms	• Identifying safety issues at work • Identifying health issues at work • Identifying the preventive measures to be taken • Following safety procedures • Identify Hazards • Assess nature of risks • Control risks • Notify serious incidents	• Keep the work area clean and free form clutter • Check if the tools and equipment are in a good working condition • Use of Safety Gears	05
5.	Devise the plan for Improving Work Process	• Achieving zero defect in work • Planning the schedule for maintenance and quality check • Ensuring quality and timely completion of work • Maintaining clean and clutter free work area	• Identify the faults • List the failures • List the type of defects and their prevention based on the history of the faults	05
			Total Duration in Hours	**25**

Unit 2: Wiring a Control Panel				
S. No.	**Learning Outcome**	**Theory (20 Hours)**	**Practical (25 Hours)**	**45 Hrs**
1.	Illustrate the basics of wiring	• Understand the following • Wire specifications • Wire preparations • Different types of wire connections in domestic wiring • Wiring of basic circuits • Sizing the wiring • Add Indian electricity rules and regulations • Study types of joint	• Use insulation removal tool • Use cable stripper • Use crimping tool • Examine the wiring of basic circuits • Examine the types of joint • List the specifications of different types of wires and connectors	10
2.	Describe the importance of earthing and its types	• Purpose of earthing • Concept of earthing • Components of earthing system • Types of earthing • Methods of earthing	• Connect all the bare copper wires to the ground bus • Identify the earthing system • Dig a hole for earthing • Connect wire of earthing through clamps • Connect earthing rods in parallel	10
3.	Outline the standard guideline for wire control components	• General specification for electrical work • Work and safety standards • Identifying different electrical codes and standards • Identifying government rules and regulations for electrical work	• List all the iec standards related to small control panels • List different electrical codes and standards for a small control panel for residential junction box • List government rules and regulations for electrical work	10
4.	Perform the wiring of an electrical control panel	• Determining boq of components • Checking received material for specifications as per drawing. • Creating channel layout • Selecting the correct conductor • Testing for shorts / continuity • Cutting required lengths using ferrules & cable lugs • Terminal tightening torque • Checking the circuits • Dressing the cables • Using cable glands (single compression/double compression)	• Use the wiring diagram accurately to meet the • Specifications • Ensure that approved components or modules are available in good condition • Bend the wires so that the wiring has a neat appearance after completion • Collect wire or cables to carry out the wiring • Process • Measure the voltage drop in the wiring system • Check that the panel is positioned as prescribed, and is following safety norms • Check that tools and equipment used in the • Wiring process are in safe and usable condition • Install the feeder pipe in the panel	15

			• Pull the feeder wires into the panel through the feeder pipe installed • Ensure that there is enough wire to get to the opposite end of the control panel • Connect the neutral wire to the neutral bus of the panel • Strip the wire just enough before making any connections • Follow the wiring diagram in order to install the branch circuit wires • Ensure that the outer sheathing is stripped in order to expose the conductor • Make sure that wires used for installation are of appropriate size	
			Total Duration in Hours	**45**

Unit 3: Safety precautions for electrical work				
S. No.	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20Hrs**
1.	Implement safety measures in workshop	• Shop discipline • Safety precautions electric • Explain safety precautions to be observed in electrical jobs or workshops • Shock – causes of electric shock, • Artificial respiration	• Visit a electrical workshop and observe the safety procedures followed • Prepare a list of emergency contact numbers • Demonstrate the procedure for separating a person from contact with live wire • Demonstrate cpr on a person • Demonstrate the use of first-aid	10
2.	Demonstration of fire protection	• Importance of fire extinguishers • Parts of fire extinguishers • Causes of fire, types of fire	• Identify the types and causes of fire • Identify the location of fire extinguishers fitted in schools • Draw the sketch of fire extinguishers uses • Operate various fire extinguishers • Watch a video on YouTube demonstrating the use of fire extinguishers	10
			Total Duration in Hours	**20**

6. ORGANISATION OF FIELD VISITS

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

Visit a site and observe the following: Location, Site, Office building, Control Panel, Tools and Equipment, Video recorder and storage system. During the visit, students should obtain the following information from the owner or the supervisor of the Data Center:

1. Area required for the junction box installation
2. Mounting of the control panels
3. Wiring of the control panels
4. Assembling of the control panels
5. Meter connections of the control panels
6. Procedure of fault checking
7. People and worker engaged

7. LIST OF EQUIPMENT AND MATERIALS

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

1. Pliers
2. Screwdrivers and nut drivers
3. Wire strippers
4. Fishing tools
5. Voltmeter
6. Ammeter
7. La belling machines
8. Power drills and drivers
9. Hammer/drills
10. Circuit Testers
11. Knife
12. Electrical Tape
13. Duct Tape
14. A Tool Pouch
15. Ladders and Step Stools
16. Allen Wrench Set (Hex Set)
17. Wire Simpers
18. Non-contact Voltage Detector
19. Tester

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:

S. No.	Qualification	Minimum Competencies	Age Limit
1	Bachelor of Engineering in Electronics/ Electrical. Additionally should have done a Diploma or certificate course in Control Panel Wiring of residential/ Industrial systems. The suggested qualification is the minimum criteria. However higher qualifications such as Bachelor of Engineering in Electronics.	The candidate should have a minimum of 3 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 counseling activities conducted at Institutional, District and State level;
- Adoption of innovative teaching and training methods;
- Improvement in result of vocational students of Class X or Class XII;
- Continuous up-gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
- Membership of professional society at District, State, Regional, National and International level;
- Development of teaching-learning materials in the subject area;

- Efforts made in developing linkages with the Industry/Establishments;
- Efforts made towards involving the local community in Vocational Education
- Publication of papers in National and International Journals;
- Organisation of activities for promotion of vocational subjects;
- **I**nvolvement in placement of students/student support services.

9. LIST OF CONTRIBUTORS

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