LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: Cable Jointer Electrical Power System

(QUALIFICATION PACK: Ref. Id. PSS/Q1002)

SECTOR: Power

Classes11 and 12

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

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

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

http://www.psscive.ac.in

Gandhiji's Talisman

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

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

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

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Power- Cable Jointer Electrical Power System

June, 2017

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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 *RashtriyaMadhyamikShikshaAbhiyan* (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 **Cable Jointer Electrical Power System.** 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 Education Research and Training

PREFACE

India today stands poised at a very exciting juncture in its saga. The potential for achieving inclusive growth are immense and the possibilities are equally exciting. The world is looking at us to deliver sustainable growth and progress. To meet the growing expectations, India will largely depend upon its young workforce. The much-discussed demographic dividend will bring sustaining benefits only if this young workforce is skilled and its potential is channelized in the right direction.

In order to fulfil the growing aspirations of our youth and the demand of skilled human resource, the Ministry of Human Resource Development (MHRD), Government of India introduced the revised Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education 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 ShiskhaAbhiyan* (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

ACKNOWLEDGEMENTS

On behalf of the team at the PSS Central Institute of Vocational Education (PSSCIVE) we are grateful to the members of the Project Approval Board (PAB) *of RashtriyaMadhyamikShikshaAbhiyan* (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 learning outcome-based 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), National Skill Development Corporation (NSDC) and Power sector Council of India (PSSCI) for their academic support and cooperation.

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

The contributions made by Dr. Vinay Swarup Mehrotra, Professor and Head, Curriculum Development and Evaluation Centre (CDEC), Dr. Vipin Kumar Jain, Associate Professor and Head, Programme Planning and Monitoring Cell (PPMC), Dr. 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 Prof. Saurabh Prakash, Professor and Head, Department of Engineering and Technology for development of the curriculum.

The contribution of Mr. Gaurav Kathel, Consultant is duly acknowledged.

PSSCIVE Team

CONTENTS

1. COURSE OVERVIEW

COURSE TITLE: POWER- CABLE JOINTER ELECTRICAL POWER SYSTEM

Cable Jointer Electrical Power System is responsible for underground cables joint and repair, also prepares overhead cable terminations. Cable jointer works on cable jointing and connects them to the power transmission and distribution systems. They also run tests to check the cabling system performance and locate faults, making any necessary repairs. Cable jointer works on joints of low voltage (LV) and high voltage cables (11kV) with the circuits dead and earthed locally at both ends of cables. He also needs to locate cable faults.

COURSE OUTCOMES : On completion of the course, student 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 ability of finding the correct cable jointer
- ☐ Change, remove and Install new cable
- ☐ Skills of Electrical Safety
- ☐ Measuring and understanding of cable jointing in the field

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

COURSE LEVEL: This is an intermediate level course. On completion of this course, a student can take up a technical level related to power sector course in polytechnic and engineering college level course.

COURSE DURATION: **600 hrs**

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

2. SCHEME OF UNITS AND ASSESSMENT

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

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

CLASS 11			
	Units	**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1: Communication Skills-III	25	**10**
	Unit 2: Self-management Skills-III	25	
	Unit 3: Information and Communication Technology Skills-III	20	
	Unit 4: Entrepreneurial Skills-III	25	
	Unit 5: Green Skills-III	15	
	Total	**110**	**10**
Part B	**Vocational Skills**		
	Unit 1: Basic Electricity-I	50	30
	Unit 2: Handling tools and equipment's	25	
	Unit 3: Electrical wiring components and accessories	30	
	Unit 4: Installation of the Cable	60	
	Total	**165**	**30**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	**15**	**15**
Part E	**Continuous and Comprehensive Evaluation (CCE)**		
	Total	**05**	**10**
	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: Information and Communication Technology Skills-IV	20	
	Unit 4: Entrepreneurial Skills-IV	15	
	Unit 5: Green Skills-IV	5	
	Total	**110**	**10**
Part B	**Vocational Skills**		
	Unit 1: Basic Electricity-II	30	40
	Unit 2: Repair and Maintenance of the cable system	90	
	Unit 3: Safety Precautions for electrical work	45	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	**15**	**15**
	Continuous and Comprehensive Evaluation (CCE)		
	Total	**05**	
	Grand Total	**300**	**100**

3. TEACHING/TRAINING ACTIVITIES

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

CLASSROOM ACTIVITIES

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

PRACTICAL WORK IN LABORATORY/WORKSHOP

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

FIELD VISITS/ EDUCATIONAL TOUR

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

4. ASSESSMENT AND CERTIFICATION

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

The National Skills Qualifications Framework (NSQF) is based on outcomes referenced to the National Occupation Standards (NOSs), rather than inputs. The NSQF level descriptors, which are the learning outcomes for each level, include the process, professional knowledge, professional skills, core skills and responsibility. The assessment is to be undertaken to verify that individuals have the knowledge and skills needed to perform a particular job and that the learning programme undertaken has delivered education at a given standard. It should be closely linked to certification so that the individual and the employer could come to know the competencies acquired through the vocational subject or course. The assessment should be reliable, valid, flexible, convenient, 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 (Hrs)
1.	Unit 1 : Communication Skills-III	25
2.	Unit 2 : Self-management Skills-III	25
3.	Unit 3 : Information and Communication Technology Skills-III	20
4.	Unit 4 : Entrepreneurial Skills-III	25
5.	Unit 5 : Green Skills-III	15
	Total	**110**

Unit 1: Communication Skills – III

Learning Outcome	Theory (08hrs)	Practical (12hrs)	Duration (20 Hrs)
1. Demonstrate knowledge of various methods of communication	1. Methods of communication - Verbal - Non-verbal - Visual	1. Writing pros and cons of written, verbal and non-verbal communication 2. Listing do's and don'ts for avoiding common body language mistakes	**05**
2. Identify elements of communication cycle	1. Meaning of communication 2. Importance of communication skills 3. Elements of communication cycle– (i) sender, (ii) ideas,	1. Draw a diagram of communication cycle 2. Role plays on communication process related to the sector/job role	**05**

	(iii) encoding, (iv) communication channel, (v) receiver, (vi) decoding, and (vii) feedback		
3.Identify the factors affecting our perspectives in communication	1. Perspectives in communication 2. Factors affecting perspectives in communication - Visual perception - Language - Past experience - Prejudices - Feelings - Environment	1. Group discussion on factors affecting perspectives in communication 2. Sharing of experiences on factors affecting perspectives 3. Sharing experiences on factors affecting communication at workplace	**05**
4. Demonstrate the knowledge of basic writing skills	1. Writing skills related to the following: • Phrases • Kinds of sentences • Parts of sentence • Parts of speech • Use of articles • Construction of a paragraph	1. Demonstration and practice of writing sentences and paragraphs on topics related to the subject	**05**
Total			**20**

Unit 2: Self-management Skills – III

Learning Outcome	Theory (07hrs)	Practical (03hrs)	Duration (10 Hrs)
1. Describe the meaning and importance of self-management	1. Meaning of self-management 2. Positive results of self-management 3. Self-management skills	1. Identification of self-management skills 2. Strength and weakness analysis	**05**
2. Identify the factors that helps in building self-confidence	1.Factors that help in building self-confidence – social, cultural, and physical factors 2.Self-confidence building tips – getting rid of the negative thoughts, thinking	1.Role play exercises on building self-confidence 2. Use of positive metaphors/ words 3. Positive stroking on wakeup and before	**05**

	positively, staying happy with small things, staying clean, hygienic and smart, chatting with positive people, etc.	going bed 4. Helping others and working for community	
Total			**10**

Unit 3: Information and Communication Technology Skills – III			
Learning Outcome	**Theory (06hrs)**	**Practical (14hrs)**	**Duration (20 Hrs)**
1. Describe the role of Information and Communication Technology (ICT) in day-to-day life and workplace	1. Introduction to ICT 2. Role and importance of ICT in personal life and at workplace 3. ICT in our daily life (examples) 4. ICT tools - Mobile, tab, radio, TV, email, etc.	1. Discussion on the role and importance of ICT in personal life and at workplace. 2. Preparing posters / collages for showing the role of ICT at workplace	**04**
2.Identify components of basic computer system and their functions	1. Computer system - Central Processing Unit (CPU), memory, motherboard, storage devices 2. Hardware and software of a computer system 3. Role and functions of Random Access Memory(RAM) and Read Only Memory(ROM) 4. Role and functions of Central Processing Unit 5. Procedure for starting and shutting down a computer	1. Connecting the cables and peripherals to the Central Processing Unit 2. Starting and shutting down a computer 3. Group discussion on the various aspects of hardware and software	**07**
3. Demonstrate use of various components and peripherals of computer system	1. Peripherals devices and their uses – mouse, keyboard, scanner, webcam, etc. of a computer system	1. Identification of various parts and peripherals of a computer 2. Demonstration and practice on the use of mouse 3. Demonstration and practice on the use of	**05**

		keyboard 4. Demonstration of the uses of printers, webcams, scanner and other peripheral devices 5. Drawing diagram of computer system and labelling it	
4. Demonstrate basic computer skills	1. Primary operations on a computer system – input, process, storage, output, communication networking, etc.	1. Identification of the various input and output units and explanation of their purposes	**04**
Total			**20**

Unit 4: Entrepreneurial Skills – III			
Learning Outcome	**Theory (06 hrs)**	**Practical (09 hrs)**	**Duration (15 Hrs)**
***1.* Identify various types of business activities**	1. Types of businesses – service, manufacturing, hybrid 2. Types of businesses found in our community 3. Business activities around us	1. Prepare posters of business activities found in cities/villages, using pictures 2. Discuss the various types of activities, generally adopted by small businesses in a local community 3. Best out of waste 4. Costing of the product made out of waste 5. Selling of items made from waste materials 6. Prepare list of businesses that provides goods and services in exchange for money	**09**
2. Demonstrate the knowledge of distinguishing characteristics of entrepreneurship	1. Meaning of entrepreneurship development 2. Distinguishing characteristics of entrepreneurship 3. Role and rewards of	1. Prepare charts showing advantages of entrepreneurship over wages 2. Group discussions on role and features of entrepreneurship	**06**

	entrepreneurship	3. Lectures/presentations by entrepreneurs on their experiences and success stories 4. Identify core skills of successful entrepreneur	
Total			**15**

Unit 5: Green Skills – III			
Learning Outcome	**Theory (07 hrs)**	**Practical (03 hrs)**	**Duration (10 Hrs)**
1. Demonstrated the knowledge of the factors influencing natural resource conservation	1. Introduction to environment, 2. Relationship between society and environment, ecosystem and factors causing imbalance 3. Natural resource conservation 4. Environment protection and conservation	1. Group discussion on hazards of deteriorating environment 2. Prepare posters showing environment conservation 3. Discussion on various factors that influence our environment	**05**
2. Describe the importance of green economy and green skills	1.Definition of green economy 2. Importance of green economy	1. Discussion on the benefits of green skills and importance of green economy 2. Prepare a Poster showing the importance of green economy with the help of newspaper/magazine cuttings	**05**
Total			**10**

Part B: Vocational Skills

S.No.	Units	Duration (Hrs)
1.	Basic Electricity-I	50
2.	Handling tools and equipment's	25
3.	Electrical wiring components and accessories	30

4.	Installation of the Cable	60
	Total	**165**

Unit 1: Basic Electricity-I

Learning outcome	Theory	Practical	Duration
1. Illustrate basic electricity generation concept	1. Origin of electricity 2. Importance of electricity 3. Generation of electricity	1. List the sources of electricity 2. Draw a sketch to show how electricity is generated	**10**
2. Describe basic units and definition of electricity	1. Electricity – concept and definition 2. Definition of voltage, current, resistance, capacitance and inductance 3. Understanding series and parallel connection. 4. Describe the ohm's law 5. Understand KVL and KCL by evaluating basic circuits containing resistor	1. Identification of various electrical symbols. 2. Demonstration of ohm's law and do practice 3. Voltage and current measurement using multi meter 4. Identify conductors, resistors & insulators 5. Make a simple circuit with passive components and verify using multi meter	**10**
3. Explain the concept of electrical power and energy	1. Difference between power and energy 2. Power and energy calculation in DC and AC systems 3. Concept of power factor 4. Single and three phase system 5. Transmission of electricity at different voltage levels.	1. Measure voltage and current using multi meter 2. Calculate the instantaneous power consumption 3. Calculate the real and reactive power from the power factor 4. Check the residential meter for instantaneous load	**10**
4. Explain the importance of earthing system	1. Earthing importance and types 2. Lightning arrester 3. Tools used for checking earth resistance	1. Demonstrate the use of earth resistance meter 2. Measure the earth resistance	**10**
Total			**50**

Unit 2: Handling tools and equipment's

Learning outcome	Theory	Practical	Duration

1. Demonstrate electrical Hand Tools safely	1. Electrical hand tools – Pliers, screw drivers, connectors, hammers, tester, electrician knife, wire-stripper etc. their specifications-size and numbers 2. Various electrical hand tools 3. Safety precautions while using tools 4. Working of various hand tools and their use 5. State Specifications of tools	1. Draw the sketches of electrical hand tools. 2. List out the various electrical hand tools 3. Demonstrate safety precautions while using tools 4. Select the appropriate hand tools for work 5. Perform the various operation using hand-tools safely 6. Visit to the market and note the brand of various electrical hand tools	**10**
2. Measure electrical and electronic parameters accurately with precautions	1. Electronic Meter 2. Ammeter and Voltmeter: 3. Details of ammeter & voltmeter parts, working and operation 4. Practice safety precautions for different types of meters while using in circuits.	1. List out various part of electronic meter 2. Identify and explain various parts of electronic meter 3. Demonstrate the connection to electronic meter, ammeter and voltmeter 4. Demonstrate the types and specification of different type of meter 5. Draw the wiring diagram of joints	**15**
Total			**25**

Unit 3: Electrical wiring components and accessories			
Learning outcome	**Theory**	**Practical**	**Duration**
1. Identify and select the wiring materials and components	1. Wiring material 2. Application of wiring material 3. Electrical wiring accessories and their specifications 4. Material for PVC casing capping wiring 5. Material for PVC & MS conduit pipe wiring: Material for concealed wiring 6. CDP, ICTP, starters, distribution board	1. Identify various wiring materials and different types of wires and their specification 2. List various wiring materials 3. Identify various wiring materials 4. Connect the accessories with the wires 5. Connect the different types of components with wires in a junction box	**10**
2. Draw Wiring Circuits & fix wiring accessories on	1. Fix wiring accessories on board by screws 2. Series and parallel	1. Fixing wiring accessories on board 2. circuit diagram of	**10**

board.	connections of lamp	simple wiring 3. Draw circuit diagram of wiring 4. Check the connection of one lamp by one switch 5. Check the connection of lamps by one switch (series) 6. Check the connection of lamps by two switch (parallel) 7. Demonstrate and identify different types of wires and cables	
3. Describe the various types of cable joints	1. Need and importance of underground cable jointing procedure 2. Types of joints and their uses 3. Types of wires and cables 4. Specification of wires and cables, 5. Precautions while using various types of cables	1. List out material and tools required for underground cable jointing 2. Demonstrate the skinning of the plastic covering of the cable 3. Prepare underground cable jointing, with crimping lug jointing etc. 4. Prepare a straight joint of 7/20 PVC wire 5. Prepare a "T" joint of 7/20 PVC wire 6. Prepare a Britannia joint of Bare copper conductor (overhead line)	**10**
Total			**30**

Unit 4: Installation of the Cable

Learning outcome	Theory	Practical	Duration
1. Identify and classify cables	1. Cable, Type of cable on the basis of different power equipment's, like conductor, insulator and their application 2. Different cable sizes, their ratings, bending radii, direct laying and draw in system	1. Identify and list the different types of cables used according to different power equipment's 2. Draw the sketches of cables inner part 3. Read of specification of cable 4. Check for the continuity and resistance of the cable	**20**
2. Performing cable	1. Cable jointing	1. Prepare different types	**40**

joints	technologies-like, Epoxy joint (Cast Resins), Heat shrinks joint, AB cable jointing etc. 2. Types of cable joints and relevant usage like termination, straight through, indoor, outdoor etc. 3. Process and procedure of cable identification, isolation, grounding, digging of 4. Jointing pit and initial testing of cable 5. Jointing process and procedures	of cable joints 2. Prepare cable for various works 3. Carry out jointing activities 4. Punching and socket punching at cable termination joint 5. Insulate cable joints and terminations as per specifications and standard operating procedure	
Total			**60**

CLASS 12

Part A - Employability Skills

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

Unit 1: Communication Skills – IV

Learning Outcome	Theory (12hrs)	Practical (08hrs)	Duration (20 Hrs)
1. Demonstrate knowledge of various methods of communication	1. Methods of communication - Verbal - Non-verbal - Visual	1. Writing pros and cons of written, verbal and non-verbal communication 2. Listing do's and don'ts for avoiding common body language mistakes	**05**

3. Provide descriptive and specific feedback	1. Communication cycle and importance of feedback 2. Meaning and importance of feedback 3. Descriptive feedback - written comments or conversations 4. Specific and non-specific feedback	1. Constructing sentences for providing descriptive and specific feedback	**03**
3. Apply measures to overcome barriers in communication	1. Barriers to effective communication – types and factors 2. Measures to overcome barriers in effective communication	1. Enlisting barriers to effective communication 2. Applying measures to overcome barriers in communication	**04**
4. Apply principles of communication	1. Principles of effective communication 2. 7 Cs of effective communication	1. Constructing sentences that convey all facts required by the receiver 2. Expressing in a manner that shows respect to the receiver of the message 3. Exercises and games on applying 7Cs of effective communication	**03**
5. Demonstrate basic writing skills	2. Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	1. Demonstration and practice of writing sentences and paragraphs on topics related to the subject	**05**
Total			**20**

Unit 2: Self-management Skills – IV

Learning Outcome	Theory (05 hrs)	Practical (05 hrs)	Duration (10 Hrs)
1. Apply stress management techniques	1. Meaning and importance of stress management 2. Stress management	1. Exercises on stress management techniques – yoga, meditation, physical exercises	**06**

	techniques – physical exercise, yoga, meditation 3. Enjoying, going to vacations and holidays with family and friends 4. Taking nature walks	2. Preparing a write-up on an essay on experiences during a holiday trip	
3. Demonstrate the ability to work independently	1. Importance of the ability to work independently 2. Describe the types of self-awareness 3. Describe the meaning of self-motivation and self-regulation	1. Demonstration on working independently 2. Goals Planningof an activity 3. Executing tasks in a specific period, with no help or directives 4. Demonstrationon the qualities required for working independently	**04**
Total			**10**

Unit 3: Information and Communication Technology Skills– IV			
Learning Outcome	**Theory (08hrs)**	**Practical (12hrs)**	**Duration (20 Hrs)**
1. Distinguish between differentoperating systems	1. Classes of operating systems 2. Menu, icons and task bar on the desktop 3. File concept, file operations, file organization, directory structures, and file-system structures 4. Creating and managing files and folders	1. Identification of task bar, icons, menu, etc. 2. Demonstration and practicing of creating, renaming and deleting files and folders, saving files in folders and sub-folders, restoring files and folders from recycle bin	**17**
2. Apply basic skills for care and maintenance of computer	1. Importance and need of care and maintenance of computer - Cleaning computer components - Preparing maintenance schedule - Protecting computer against viruses - Scanning and cleaning	1. Demonstrationof the procedures to be followed for cleaning, care and maintenance of hardware and software	**03**

	viruses and removing SPAM files, temporary files and folders		
Total			**20**

Unit 4: Entrepreneurial Skills – IV			
Learning Outcome	**Theory (06 hrs)**	**Practical (09 hrs)**	**Duration (15 Hrs)**
1. List the characteristics of successful entrepreneur	1. Entrepreneurship and society 2. Qualities and functions of an entrepreneur 3. Role and importance of an entrepreneur 4. Myth about entrepreneurship 5. Entrepreneurship as a career option	1. Writing a note on entrepreneurship as career option 2. Collecting success stories of first generation and local entrepreneurs 3. Listingthe entrepreneurial qualities – analysis of strength and weaknesses 4. Group discussionof self-qualitiesthat students feel are needed to become successful entrepreneur 5. Collect information and related data for a business 6. Make a plan in team for setting up a business	**15**
Total			**15**

Unit 5: Green Skills – IV			
Learning Outcome	**Theory (07 hrs)**	**Practical (03 hrs)**	**Duration (10 Hrs)**
1. Demonstrate the knowledge of importance, problems and solutions related tosustainable development	1. Definition of sustainable development 2. Importance of sustainable development 3. Problems related to sustainable development	1. Identify the problem related to sustainable development in the community 2. Group discussion on the importance of respecting and conserving indigenous knowledge and cultural	**10**

		heritage 3. Discussion on the responsibilities and benefits of environmental citizenship, including the conservation and protection of environmental values 4. Preparing models on rain water harvesting, drip / sprinkler irrigation, vermin-compost, solar energy, solar cooker, etc.	
Total			**10**

Part B–Vocational Skills

S.No.	Units	Duration (Hrs)
1.	Basic Electricity-II	30
2.	Repair and Maintenance of the cable system	90
3.	Safety Precautions for electrical work	45
4.		
	Total	**165**

Unit 1: Basic Electricity-II			
Learning outcome	**Theory**	**Practical**	**Duration**
1. Describe basic electrical quantity	1. SI units Basic electrical quantity – current, voltage, resistance, load, energy power, work 2. Constant current source 3. Constant voltage source 4. Measuring instruments for electrical quantities 5. Importance and use of various electrical quantity	1. Make list of the basic electrical quantity 2. List out and name the basic units of electrical quantity Identify and draw the symbols for each electrical quantity 3. Define the various electrical quantity 4. List out and name the measuring instruments required to measure the various electrical quantity	**10**
2. Identify electronic components	1. Electronic components Types of components – active and passive components	1. Identification of electronic components 2. Prepare a list the types of components	**10**

	2. Active components – current source, voltage source 3. Passive components – register, capacitor, inductor 4. List and name the various active and passive components 5. Types and features of passive components I 6. Importance and use of electronic components Color codes for passive components	3. Identify the various types of register, capacitor and inductor 4. Identify electronic components in circuit 5. Identify the passive components by visual inspection 6. Identify and interpret the coded marking of colors on the registers	
3. Draw and design basic circuits	1. Drawing of simple series & parallel circuits and symbols 2. Circuit types – series connection, parallel connection, series-parallel connection 3. Calculations of value of resistors in resistive circuits	1. List the types of electrical circuits 2. Draw simple series & parallel circuits R 3. Reading of circuit diagram and prepare report 4. Calculate the value of passive components in series and parallel circuits.	**10**
Total			**30**

Unit 2: Repairing and Maintenance of the cable system			
Learning outcome	**Theory**	**Practical**	**Duration**
1. Checking the cable for faults and diagnostics	1. Faults and reasons for faults in cable 2. Procedure for cables diagnostics 3. Identify the faults in the cable based on the line diagram 4. Repairing of the cables according the standard operating procedure 5. Safety methods 6. Tools used for checking faults	1. Practice on cable: continuity test, clamping of cables, earthing of cables 2. Test the continuity, clamping and earthing of the cables 3. Observe the working on live line 4. Report the procedure of handling the live lines 5. Demonstrate the use of protective equipments like gloves, pliers and screwdrivers for live line	**30**
2. Maintaining the work area	1. Method of Implementation of Standard operating	1. List the maintenance schedule 2. Read the received	**20**

	procedure in the work environment	complaints 3. Identify the faults in the cables as per standard operating procedure	
3. Maintenance of cables	1. Continuity tests 2. Resistance of cables 3. Corrosion in the connections 4. Checking loose connections	1. Check the continuity of cables by meter 2. Clamping of cables and tightening by tools 3. Check the earthing cable armor 4. Checking of Tee and Straight LV joints and terminations	**40**
Total			**90**

Unit 3: Safety Precautions for electrical work			
Learning outcome	**Theory**	**Practical**	**Duration**
1. Implement safety measures in workshop	1. Shop discipline 2. Safety precautions Electric 3. Explain safety precautions to be observed in electrical jobs or workshops 4. Shock – causes of electric shock, 5. Artificial respiration	1. Visit a electrical workshop and observe the safety procedures followed 2. Prepare a list of emergency contact numbers 3. Demonstrate the procedure for separating a person from contact with live wire 4. Demonstrate CPR on a person 5. Demonstrate the use of First-aid	**25**
2. Demonstration of fire protection	1. Importance of fire extinguishers 2. Parts of fire extinguishers 3. Causes of fire, types of fire	1. Identify the types and causes of fire 2. Identify the location of fire extinguishers fitted in schools 3. Draw the sketch of fire extinguishers uses 4. Operate various fire extinguishers 5. Watch a video on YouTube demonstrating the use of fire extinguishers	**20**

Total			**45**

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 power substation, transmission line site, construction site. During the visit, students should obtain the following information from the Assistant engineer, supervisor and lineman of the centre.

1. Connection to the pole
2. Area under substation and its layout
3. Types of power cables
4. Type of connections
5. Methods of connecting and changing the cable
6. Any other information
7. Area required for the junction box installation
8. Mounting of the control panels
9. Wiring of the control panels
10. Connection of cable with the transformer
11. Types of joints in the cable
12. Procedure of fault checking
13. 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. Labelling 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 Crimpers
18. Non-contact Voltage Detector
19. Tester

8. VOCATIONAL TEACHER'S/ TRAINER'S QUALIFICATION AND GUIDELINES

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

S.No.	Qualification	Minimum Competencies	Age Limit
1.	B. Tech in Electrical Engineering from a recognized Institute /University, with at least 1 year work/teaching experience or Diploma in Electrical Engineering with 3 years of work /teaching experience	• Effective communication skills (oral and written) • Basic computing skills	18-37 years (as on Jan. 01 (year)) Age relaxation to be provided as per Govt. rules

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

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

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

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

OR

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

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

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

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

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

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

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

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

The Head Master/Principal of the school where the scheme is being implemented should facilitate and ensure that the Vocational Teachers/Trainers:

(i) Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
(ii) Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
(iii) Make effective use of learning aids and ICT tools during the classroom sessions;

(iv) Engage students in learning activities, which include a mix of different methodologies, such as project-based work, team work, practical and simulation-based learning experiences;
(v) Work with the institution's management to organise skill demonstrations, site visits, on-job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
(vi) Identify the weaknesses of students and assist them in up-gradation of competency;
(vii) Cater to different learning styles and level of ability of students;
(viii) Assess the learning needs and abilities, when working with students with different abilities
(ix) Identify any additional support the student may need and help to make special arrangements for that support;
(x) Provide placement assistance

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

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

9. LIST OF CONTRIBUTORS

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