LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE:

Optical Fibre Splicer

(QUALIFICATION PACK: Ref. Id. TEL/Q6400)

Sector: Telecom

Classes 9 and 10

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
Shyamla Hills, Bhopal – 462 002, M.P., India
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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 **Telecom – Optical Fibre Splicer**. 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

ACKNOWLEDGMENT

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 course coordinator Dipak D. Shudhalwar, Associate Professor (CSE), PSSCIVE, for his earnest effort and contributions in the development of this learning outcome based curriculum. The 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, Department of Engineering and Technology, PSSCIVE in development of the curriculum for the employability skills are duly acknowledged.

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

CONTENTS

1. COURSE OVERVIEW

COURSE TITLE: Optical Fibre Splicer

An Optical Fibre Splicer is responsible for ensuring efficient splicing of the optical fibre cables and supports in optical fibre installation and in carrying out fibre testing using OTDR and power meter.

This job requires the individual to work in field set-up and be able to handle pressure situations. He should have basic written and oral communication skills and should be able to apply practical judgement to successfully perform the assigned responsibilities.

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;
- ✓ Prepare cable for splicing;
- ✓ Carry out splicing operations;
- ✓ Test effectiveness of the splice through OTDR and power meter tests;
- ✓ Close the activity and document the test results;
- ✓ Co-ordinate trenching, laying, jointing and blolwing of cables;
- ✓ Carry out splicing of cables.

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 9 and 10. After completion of this course, the student can go for the course on Optical Fibre Technician in class 11 and 12.

COURSE DURATION: 400 Hours

Class 9 : 200 hrs

Class 10 : 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 9 is as follows:

CLASS 9			
	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	20	
	Unit 4: Entrepreneurial Skills	15	
	Unit 5: Green Skills	10	
	Total	**75**	**10**
Part B	**Vocational Skills**		
	Unit 1: Communication Technology	20	**30**
	Unit 2: Splicing Tools and Equipment	15	
	Unit 3: Splicing Operations	30	
	Unit 4: Optical Fiber Testing	15	
	Unit 5: Maintain Health and Safety	15	
	Total	**95**	**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	**200**	**100**

The unit-wise distribution of hours and marks for **Class 10** is as follows:

CLASS 10			
	Units	**No. of Hours for Theory and Practical 200**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Communication Skills	20	**10**
	Self-management Skills	10	
	Basic ICT Skills	20	
	Entrepreneurial Skills	15	
	Green Skills	10	
	Total	**75**	**10**
Part B	**Vocational Skills**		
	Unit 1: Fiber Optic Communication and Route Inspection	20	**30**
	Unit 2: Splicing Tools and Process	25	
	Unit 3: Cable laying and Installation	15	
	Unit 4: Testing Installation of OFC	15	
	Unit 5: Health & Safety Measures and Networking	20	
	Total	**95**	**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**	**10 Hours**	
	Practical File/ Student Portfolio	10	10
	Viva Voce	5	5
	Total	**15**	**15**
Part E	**Continuous and Comprehensive Evaluation (CCE)**	**05**	**10**
	Total	**200**	**100**

3. TEACHING/TRAINING ACTIVITIES

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

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

CLASSROOM ACTIVITIES

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

Sn.	Typology of Question	Very Short Answer Q. (1 mark)	Short Answer Q (2 Marks)	Long Answer Questions (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 Ques)**

SKILL ASSESSMENT (PRACTICAL)

Assessment of skills by the students should be done by the assessors/examiners on the basis of practical demonstration of skills by the candidate, using a competency checklist. The competency checklist should be developed as per the National Occupation Standards (NOSs) given in the Qualification Pack for the Job Role to bring about necessary consistency in the quality of assessment across different sectors and Institutions. The student has to demonstrate competency against the performance criteria defined in the National Occupation Standards and the assessment will indicate that they are 'competent', or are 'not yet competent'. The assessors assessing the skills of the students should possess a current experience in the industry and should have undergone an effective training in assessment principles and practices. The Sector Skill Councils should ensure that the assessors are provided with the training on the assessment of competencies.

Practical examination allows candidates to demonstrate that they have the knowledge and understanding of performing a task. This will include hands-on practical exam and viva voce. For practical, there should be a team of two evaluators – the subject teacher and the expert from the relevant industry certified by the Board or concerned Sector Skill Council. The same team of examiners will conduct the viva voce.

Project Work (individual or group project) is a great way to assess the practical skills on a certain time period or timeline. Project work should be given on the basis of the capability of the individual to perform the tasks or activities involved in the project. Projects should be discussed in the class and the teacher should periodically monitor the progress of the project and provide feedback for improvement and innovation. Field visits should be organised as part of the project work. Field visits can be followed by a small-group work/project work. When the class returns from the field visit, each group might be asked to use the information that they have gathered to prepare presentations or reports of their observations. Project work should be assessed on the basis of practical file or student portfolio.

Student Portfolio is a compilation of documents that supports the candidate's claim of competence. Documents may include reports, articles, photos of products prepared by students in relation to the unit of competency.

Viva voce allows candidates to demonstrate communication skills and content knowledge. Audio or video recording can be done at the time of viva voce. The number of external examiners would be decided as per the existing norms of the Board and these norms should be suitably adopted/adapted as per the specific requirements of the vocational subject. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits.

CONTINUOUS AND COMPREHENSIVE EVALUATION

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

5. UNIT CONTENTS

CLASS 9

Class IX, 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	20
4.	Unit 4: Entrepreneurial Skills – I	15
5.	Unit 5: Green Skills – I	10
	Total	**75**

Unit 1: Communication Skills – I				
Sn	**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 basic writing skills	• Writing skills related to the following: • Phrases • Kinds of sentences • Parts of sentence • Parts of speech • Use of articles • Construction of a paragraph	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject.	05
			Total Duration in Hours	**20**

Unit 2: Self Management Skills – I				
Sn	**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				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20 Hrs**
1.	Demonstrate the knowledge of the role of Information and Communication Technology (ICT) in day-to-day life and workplace	• 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	04
2.	Identify components of basic computer system and their	• Computer system – Central Processing Unit (CPU), memory, motherboard, storage devices	• Connecting the cables and peripherals to the Central Processing Unit • Starting and shutting down	07

	functions	• Hardware and software of a computer system • Role and functions of Random Access • Memory (RAM) and Read • Only Memory (ROM) • Role and functions of Central Processing Unit • Procedure for starting and shutting down a computer	a computer • Group discussion on the various aspects of hardware and software	
3.	Demonstrate use of various components and peripherals of computer system	• Peripherals devices and their uses – mouse, keyboard, scanner, webcam, etc. of a computer system	• Identification of various parts and peripherals of a computer • Demonstration and practice on the use of mouse • Demonstration and practice on the use of keyboard • Demonstration of the uses of printers, webcams, scanner and other peripheral devices • Drawing diagram of computer system and labelling it	05
4.	Demonstrate basic computer skills	• Primary operations on a computer system – input, process, storage, output, communication networking, etc.	• Identification of the various input and output units and explanation of their purposes	04
			Total Duration in Hours	**20**

Unit 4: Entrepreneurial Skills – I				
Sn	**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	09

			money.	
2.	Demonstrate the knowledge of distinguishing characteristics of entrepreneurship	• Meaning of entrepreneurship development. • Distinguishing characteristics of entrepreneurship. • Role and rewards of entrepreneurship.	• Prepare charts showing advantages of 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.	06
			Total Duration in Hours	**15**

Unit 5: Green Skills – I				
Sn	**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**

Class IX, Part B: Vocational Skills

Sn.	Units	Duration in Hours
1.	Unit 1: Communication Technology	20
2.	Unit 2: Splicing Tools and Equipment	15
3.	Unit 3: Splicing Operations	30
4.	Unit 4: Optical Fiber Testing	15
5.	Unit 5: Maintain Health and Safety	15
	Total Duration	**95**

Unit 1: Optical Communication Technology				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20 Hrs**
1.	Outline the growth and opportunities in broadband and fiber industry	• Broadband technology, • Types of broadband, • Broadband market – global and Indian, • Telecommunication, • Optical fiber technology, • Basics of optics and its evolution, • Optical fiber in broadband industry • Optical fiber terminologies.	• List the various terminology in optical fiber industry, • Illustrate the use of fiber optic technology in broadband industry	04
2.	Explain the data communication	• The communication process • Concept of data communication, • Characteristics of data • Transmission media and its types, • Components of data communication, • Modes of communication	• Demonstrate the communication process, • Identify and list the various forms of data, • Observe the comunication speed for various forms of data. • Identify and name the various transmission media,	08
3.	Explain the fibre optic communication	• Basics of fibre optic communication • Structure of fibre • Fibre optic communication • Light Theory • Classification of optical fiber, • Light sources of optical fiber • Losses in optical fiber	• Demonstrate the principle of fibre optic communication. • Demonstrate the various laws of light theory – reflection, refraction, total internal reflection • Demonstrate the attenuation and dispersion in optical fiber	08
			Total Duration in Hours	**20**

Unit 2: Splicing Tools and Equipment				
Sn	**Learning Outcome**	**Theory (05 Hours)**	**Practical (10 Hours)**	**15 Hrs**
1.	Demonstrate the use of basic hand tools	• Basic hand tools – screw driver, scissors, cable cutting knife, pliers, cleaning swab, electrical tape, gloves	• Identify and name the various hand tools, • Demonstrate the use of various hand tools	05
2.	Use the splicing tools	• Splicing machine, cleaver, tissue paper, isopropyl alcohol, protection sleeves, round cutter, tube cutter, fiber cutter, fiber stripper, OTDR • Mechanical splice connector • Functioning of splicing tools	• Identify and name the various splicing tools and equipment, • Demonstrate the functioning of splicing tools and equipment, • Demonstrate the functioning of splicing machine	10
			Total Duration in Hours	**15**

Unit 3: Splicing Operations				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (20 Hours)**	**30 Hrs**
1.	Describe the splicing process	• Concept of splicing, • Need of splicing, • Splicing process, • Testing parameters of splicing, • Materials required for splicing.	• Demonstrate the general process of splicing, • Demonstrate the factors affecting the damage of the cable by natural and man made.	05
2.	Carry out fusion and mechanical splicing	• Optical fiber splicing – Fusion and mechanical splicing process, • Classification and principle of splicing, • Testing parameters.	• Demonstrate the splicing process, • Test the result of splicing.	25
			Total Duration in Hours	**30**

Unit 4: Optical Fiber Testing				
Sn	**Learning Outcome**	**Theory (05 Hours)**	**Practical (10 Hours)**	**15 Hrs**
1.	Test the fiber joint with OTDR	• Standard process of OTDR test, working, • Elements of OTDR, • Standard process of Power meter tests	• Perform OTDR test as per standard process, • Study the trace of OTDR, • Perform power meter tests as per standard process.	15
			Total Duration in Hours	**15**

Unit 5: Maintain Health and Safety				
Sn	**Learning Outcome**	**Theory (05 Hours)**	**Practical (10 Hours)**	**15 Hrs**
1.	Rules to follow while splicing	• Cut fibers, sleeves and cable pieces • Dispose of the cut fibers, sleeves and cable pieces	• Demonstrate the disposal of the cut fibers, sleeves and cable pieces	05
2.	Use appropriate personal protection equipment	• Personal protection equipment – helmets, safety boots, safety glasses	• Demonstrate to use personal protection equipment like helmets, knee pads, safety boots, safety glasses and trench guards, • Demonstrate the use of fire extinguisher, and first aid kit.	10
			Total Duration in Hours	**15**

CLASS 10

Class X, Part A: Employability Skills

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills – II	20
2.	Unit 2: Self-management Skills – II	10
3.	Unit 3: Basic ICT Skills – II	20
4.	Unit 4: Entrepreneurial Skills – II	15
5.	Unit 5: Green Skills – II	10
	Total	**75**

Unit 1: Communication Skills – II				
Sn	**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	• Constructing sentences for providing descriptive and specific feedback.	04

		feedback.		
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 • Parts of Sentence • Parts of Speech • Articles • Construction of paragraph.	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject.	04
			Total Duration in Hours	**20**

Unit 2: Self-management Skills – II				
Sn	**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				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20 Hrs**
1.	Distinguish between different operating systems	• Classes of operating systems • Menu, icons and task bar on the desktop • File concept, file operations, file organization, directory structures, and file-system structures • Creating and managing files and folders	• Identification of task bar, icons, menu, etc. • Demonstration and practising 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	• Importance and need of care and maintenance of computer - Cleaning computer components - Preparing maintenance schedule - Protecting computer against viruses - Scanning and cleaning viruses and removing SPAM files, temporary files and folders	• Demonstration of the procedures to be followed for cleaning, care and maintenance of hardware and software	03
			Total Duration in Hours	**20**

Unit 4: Entrepreneurial Skills – II				
Sn	**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. • Entrepreneurship • as a career option.	• Writing a note on entrepreneurship as career option. • Collecting success stories of first generation and local entrepreneurs. • Listing the entrepreneurial 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.	15
			Total Duration in Hours	**15**

Unit 5: Green Skills – II				
Sn	**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**

Class X, Part B: Vocational Skills

Sn	Units	Duration in Hours
1.	Unit 1: Fiber Optic Communication and Route Inspection	20
2.	Unit 2: Splicing Tools and Process	25
3.	Unit 3: Cable laying and Installation	15
4.	Unit 4: Testing Installation of OFC	15
5.	Unit 5: Health & Safety Measures and Networking	20
	Total Duration	**95**

Unit 1: Fiber Optic Communication and Route Inspection				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20 Hrs**
1.	Describe the fibre optic communication system	• Introduction to optical fibre • Optical fiber communication • Elements of optical fibre communication system • Structure of optical fibre • Concept of light propagation	• Demonstrate the propagation of light wave – reflection, refraction, total internal reflection, law of reflection, law of refraction, Snell's law • Measure the numeral aperture in fiber optics	05

		• Classification of optical fiber • Losses of optical fibers • Fiber optics cables.	• Identify the parts of fibre optic cables	
2.	Read and interpret OFC route plan	• OFC route plan, • Route inspection, • Route diagrams, • Different site condition.	• Identify the appropriate site conditions for cable laying • Draw the route plan for given site conditions, • Draw the route diagram for given site conditions.	05
3.	Inspect the site for safe and secure cable installation	• Cable laying process in the various site conditions • Safety and security of site, • Various parameters to inspect the site	• Draw the cable laying plan for the proposed site • Identify the various parameters to ensure safety and security of site for cable laying.	05
4.	Describe the different splicing methods	• Need and importance of splicing, • Splicing basics, • Types of splicing – fusion and mechanical splicing	• Demonstrate the factors affecting the damage of cables, • Demonstrate the comparison of fusion splicing and mechanical splicing.	05
			Total Duration in Hours	**20**

Unit 2: Splicing Tools and Process				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Use tools and equipment for splicing and cable laying	• Basic hand tools, • Splicing tools, • Tools and equipment for cable laying, • Cleaning tools, • Termination kit, • Procedures for using tools and equipment, • Safety and care to handle various tools and equipment.	• Make a list of various tools and equipment for cable laying process, • Identify the various tools and equipment used for cable laying process, • Identify the various types of connectors, • Demonstrate to use the various tools for splicing and cable laying, • Demonstrate to handle tools and equipment with safety and care.	10
2.	Demonstrate the splicing process	• Splicing procedure • Fusion splicing process, • Mechanical splicing process, • Testing of splicing, • Troubleshooting splicing problems	• Demonstrate the fusion splicing process • Demonstrate the mechanical splicing process, • Test the splicing, • Troubleshoot the splicing	10

3.	Post implementation of splicing	• OFC termination, • Splice trays, • Splice enclosures, • Fiber distribution frame (FDF)	• Demonstrate the preparation and termination process of optical fibre using connector, • Demonstrate to install fibre optic cable in splice tray,	05
			Total Duration in Hours	**25**

Unit 3: Cable laying and Installation				
Sn	**Learning Outcome**	**Theory (06 Hours)**	**Practical (09 Hours)**	**15 Hrs**
1.	Demonstrate to handle OFC cables	• Cable drum, • Cable storage and handling, • Inspection of the drum and cable.	• Demonstrate the method of drum preparation, • Demonstrate the methods of cable storage and its handling.	07
2.	Carry out cable laying	• Standard cable installation process, • Installation through trenching, aerial • Ducting process, • Conduct figure 8' ing', • Cable pulling and blowing	• Demonstrate the method of trenching, • Demonstrate the method of aerial fiber cable installation • Demonstrate the procedure of cable pulling and cable blowing.	08
			Total Duration in Hours	**15**

Unit 4: Testing Installation of OFC				
Sn	**Learning Outcome**	**Theory (06 Hours)**	**Practical (09 Hours)**	**15 Hrs**
1.	Test optical fiber cable	• Test preparation, • Testing optical fiber visual fault locator, • Testing optical fiber using inspection microscope, • Visual connector inspection, • Connector and cleaning procedure • Bare fiber test, • Optical return loss test, • Insertion loss test.	• Check the continuity of optical fiber with visual fault locator, • Demonstrate to use inspection microscope, • Demonstrate the method to check the inspection, • Demonstrate the cleaning of fiber ends, • Demonstrate the method of return loss using OTDR, Power meter, • Demonstrate to test insertion loss in optical fiber.	15
			Total Duration in Hours	**15**

Unit 5: Health & Safety Measures and Networking				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20 Hrs**
1.	Observe safety measures during installation of OFC	• Rules to follow the OFC – material safety, chemical safety, • Underground safety, • Working safety, • Using personal protective equipment – helmet, eye and face protection. • LASER light safety, • Ladder safety, • Fiber safety in a trench, • Documentation.	• Demonstrate to follow the rules in handling chemicals for OFC installation. • Use the personal protective equipment, • Demonstrate the use of different classes of LASER, • Demonstrate the use of ladder in trench.	10
2.	Describe the optical fiber transmission	• Attenuation loss in optical fiber, • Optical technology – FTTX, FTTP, FTTC, FTTH, • Multiplexing	• Measure optical fiber attenuation loss • Measure the bending loss in fiber, • Measure the propagation loss in optical fiber • Install a fiber broadband in Study the fiber in the home cabling reference model.	10
			Total Duration in Hours	**20**

6. ORGANISATION OF FIELD VISITS

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

Visit the site of installation of OFC and observe the following: Location, Site, Tools and Equipment, Raw Materials, Space parts, Workers behavior. During the visit, students should obtain the following information from the owner or the supervisor of the OFC site:

1. Types of Optical Fibre Cable
2. Installation premises
3. Tools and equipment used
4. Cable laying process
5. Safety precautions
6. Specifications and cost of tools and equipment
7. Total expenditure of the project
8. Manpower engaged
9. Wages of workers
10. Qualifications and skills of workers
11. Any other information

7. LIST OF EQUIPMENT AND MATERIALS

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

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
20. OTDR
21. Power Meter

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	Diploma in Electronics/ Electrical / Communication Engineering in with a Certificate or Diploma course in Optical Fibre Technology **OR** Bachelor of Engineering in Electronics/ Communication.	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:

(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:

- 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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