LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE:
Junior Software Developer
(QUALIFICATION PACK: Ref. Id. SSC/Q0508)
SECTOR: IT-ITeS

Classes 11 and 12

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
Shyamla Hills, Bhopal – 462 013, 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 **Junior Software Developer**. The curriculum has been developed for the secondary students of vocational education and is aligned to the National Occupation Standards (NOSs) of a job role identified and approved under the National Skill Qualification Framework (NSQF).

The curriculum aims to provide children with employability and vocational skills to support occupational mobility and lifelong learning. It will help them to acquire specific occupational skills that meet employers' immediate needs. The teaching process is to be performed through the interactive sessions in classrooms, practical activities in laboratories and workshops, projects, field visits, and professional experiences.

The curriculum has been developed and reviewed by a group of experts and their contributions are greatly acknowledged. The utility of the curriculum will be adjudged by the qualitative improvement that it brings about in teaching-learning. The feedback and suggestions on the content by the teachers and other stakeholders will be of immense value to us in bringing about further improvement in this document.

Hrushikesh Senapaty
Director
National Council of Educational Research & Training

PREFACE

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

In order to fulfil the growing aspirations of our youth and the demand of skilled human resource, the Ministry of Human Resource Development (MHRD), Government of India introduced the revised Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education that aims to provide for the diversification of educational opportunities so as to enhance individual employability, reduce the mismatch between demand and supply of skilled manpower and provide an alternative for those pursuing higher education. For spearheading the scheme, the PSS Central Institute of Vocational Education (PSSCIVE) was entrusted the responsibility to develop learning outcome based curricula, student workbooks, teacher handbooks and e-learning materials for the job roles in various sectors, with growth potential for employment.

The PSSCIVE firmly believes that the vocationalisation of education in the nation need to be established on a strong footing of philosophical, cultural and sociological traditions and it should aptly address the needs and aspirations of the students besides meeting the skill demands of the industry. The curriculum, therefore, aims at developing the desired professional, managerial and communication skills to fulfil the needs of the society and the world of work. In order to honour its commitment to the nation, the PSSSCIVE has initiated the work on developing learning outcome based curricula with the involvement of faculty members and leading experts in respective fields. It is being done through the concerted efforts of leading academicians, professionals, policy makers, partner institutions, Vocational Education and Training experts, industry representatives, and teachers. The expert group through a series of consultations, working group meetings and use of reference materials develops a National Curriculum. Currently, the Institute is working on developing curricula and courseware for over 100 job roles in various sectors.

We extend our gratitude to all the contributors for selflessly sharing their precious knowledge, acclaimed expertise, and valuable time and positively responding to our request for development of curriculum. We are grateful to MHRD and NCERT for the financial support and cooperation in realising the objective of providing learning outcome based modular curricula and courseware to the States and other stakeholders under the PAB (Project Approval Board) approved project of *Rashtriya Madhyamik Shiskha Abhiyan* (RMSA) of MHRD.

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

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

RAJESH P. KHAMBAYAT
Joint Director
PSS Central Institute of Vocational Education

ACKNOWLEDGEMENT

On behalf of the team at the PSS Central Institute of Vocational Education (PSSCIVE) we are grateful to the members of the Project Approval Board (PAB) *of* Rashtriya Madhyamik Shiksha Abhiyan (RMSA) and the officials of the Ministry of Human Resource Development (MHRD), Government of India for the financial support to the project for development of curricula.

We are grateful to the Director, NCERT for his support and guidance. We also acknowledge the contributions of our colleagues at the Technical Support Group of RMSA, MHRD, RMSA Cell at the National Council of Educational Research and Training (NCERT), National Skill Development Agency (NSDA) and National Skill Development Corporation (NSDC) and IT-ITeS Sector Skill Council of Indian (NASCOM) for their academic support and cooperation.

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

The contributions made by Vinay Swarup Mehrotra, Professor and Head, Curriculum Development and Evaluation Centre (CDEC), Vipin Kumar Jain, Associate Professor and Head, Programme Planning and Monitoring Cell (PPMC) and Deepak D. 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 Deepak D. Shudhalwar, Associate Professor (CSE), Head, Department of Engineering and Technology, PSSCIVE, for bringing out this curriculum in the final form.

PSSCIVE Team

CONTENTS

1. COURSE OVERVIEW

COURSE TITLE: Junior Software Developer

Individuals in this job are assigned one of the many entry level roles in the software industry including support and help desk, testing, user interaction design, maintenance, enhancement, development and documentation. They are responsible for assisting in performing the key activities and tasks involved in the assigned role. This job requires the individual to be flexible and operate under supervision for the area of work he/she is aligned to. The individual should have the necessary technical competency and be able to communicate effectively and work collaboratively. He/she should also have a willingness to learn and undertake a desk job entailing long hours

COURSE OUTCOMES: 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;
- ✓ Manage the work to meet requirements;
- ✓ Maintain a healthy, safe and secure working environment
- ✓ Assist in performing software construction and software testing entry-level tasks in the IT Services industry
- ✓ Demonstrate basic computer operations
- ✓ Demonstrate to use operating system, browser, and internet,
- ✓ Demonstrate aptitude for analyzing information and making logical conclusions.
- ✓ Demonstrate knowledge of the foundational mathematical concepts in computing.
- ✓ Design algorithms to solve problems and convert them into code using the appropriate programming language constructs.
- ✓ Read and execute a test case and record the outcome in the appropriate
- ✓ Demonstrate self and work Management
- ✓ Demonstrate working and communicating in team
- ✓ Manage Health and Safety measures at workplace
- ✓ Manage Data and Information
- ✓ Apply new knowledge and skills in the workplace, under supervision and perform self development.

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

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

COURSE DURATION: **Total : 600 hrs**
Class 11 : 300 hrs
Class 12 : 300 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	Basic ICT Skills – III	20	
Unit 4	Entrepreneurial Skills – III	25	
Unit 5	Green Skills – III	15	
	Total	**110**	**10**
Part B	**Vocational Skills**		
Unit 1	Software Construction Essentials	30	**40**
Unit 2	Operating System and Computer Network	25	
Unit 3	Data Structure	20	
Unit 4	Python Programming	60	
Unit 5	Database Management System	30	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	6	15
	Written Test	1	10
	Viva Voce	3	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit**		
	Practical File/ Student Portfolio	10	10
	Viva Voce	5	5
	Total	**15**	**15**
	Total	**300**	**100**

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

CLASS 12			
	Units	**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
Unit 1	Communication Skills – IV	25	**10**
Unit 2	Self-management Skills – IV	25	
Unit 3	Basic ICT Skills – IV	20	
Unit 4	Entrepreneurial Skills – IV	25	
Unit 5	Green Skills – IV	15	
	Total	**110**	**10**
Part B	**Vocational Skills**		
Unit 1	Software Engineering	30	**40**
Unit 2	Advanced Python Programming	50	
Unit 3	Web application Development	40	
Unit 4	Mobile Application Development	35	
Unit 5	Emerging Trends and Social Impact	10	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	6	15
	Written Test	1	10
	Viva Voce	3	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit**		
	Practical File/ Student Portfolio	10	10
	Viva Voce	5	5
	Total	**15**	**15**
	Total	**300**	**100**

3. TEACHING/TRAINING ACTIVITIES

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

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

CLASSROOM ACTIVITIES

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

PRACTICAL WORK IN LABORATORY/WORKSHOP

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

FIELD VISITS/ EDUCATIONAL TOUR

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

4. ASSESSMENT AND CERTIFICATION

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

The National Skills Qualifications Framework (NSQF) is based on outcomes referenced to the National Occupation Standards (NOSs), rather than inputs. The NSQF level descriptors, which are the learning outcomes for each level, include the process, professional knowledge, professional skills, core skills and responsibility. The assessment is to be undertaken to verify that individuals have the knowledge and skills needed to perform a particular job and that the learning programme undertaken has delivered education at a given standard. It should be closely linked to certification so that the individual and the employer could come to know the competencies acquired through the vocational subject or course. The assessment should be reliable, valid, flexible, convenient, cost effective and above all it should be fair and transparent. Standardized assessment tools should be used for assessment of knowledge of students. Necessary arrangements should be made for using technology in assessment of students.

KNOWLEDGE ASSESSMENT (THEORY)

Knowledge Assessment should include two components: one comprising of internal assessment and second an external examination, including theory examination to be conducted by the Board. The assessment tools shall contain components for testing the knowledge and application of

knowledge. The knowledge test can be objective paper based test or short structured questions based on the content of the curriculum.

WRITTEN TEST

It allows candidates to demonstrate that they have the knowledge and understanding of a given topic. Theory question paper for the vocational subject should be prepared by the subject experts comprising group of experts of academicians, experts from existing vocational subject experts/teachers, and subject experts from university/colleges or industry. The respective Sector Skill Council should be consulted by the Central/State Board for preparing the panel of experts for question paper setting and conducting the examinations.

The blue print for the question paper may be as follows:

Duration: 3 hrs **Max. Mark: 40**

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

SKILL ASSESSMENT (PRACTICAL)

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

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

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

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

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

CONTINUOUS AND COMPREHENSIVE EVALUATION

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

5. UNIT CONTENTS

CLASS 11

Part A: Employability Skills

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

Unit 1: Communication Skills – III				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Demonstrate knowledge of various methods of communication	• 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 specific communication styles	• Communication styles- assertive, aggressive, passive-aggressive, submissive, etc.	• Observing and sharing communication styles of friends, teachers and family members and adapting the best practices • Role plays on communication styles.	10
3.	Demonstrate basic writing skills	• Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject	10
			Total Duration in Hours	**25**

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

Unit 3: Basic ICT Skills – III				
Sn	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20 Hrs**
1.	Create a document on word processor	• Introduction to word processing. • Software packages for word processing. • Opening and exiting the word processor. • Creating a document	• Demonstration and practice of the following: • Listing the features of word processing, • Listing the software packages for word processing, • Opening and exit the word processor, • Creating a document	10
2.	Edit, save and print a document in word processor	• Editing text • Wrapping and aligning the text • Font size, type and face. • Header and Footer • Auto correct	• Demonstration and practicing the following: • Editing the text • Word wrapping and alignment,	10

		• Numbering and bullet • Creating table • Find and replace • Page numbering. • Printing document. • Saving a document in various formats	• Changing font type, size and face, • Inserting header and footer, • Removing header and footer, • Using autocorrect option, • Insert page numbers and bullet, • Save and print a document.	
			Total Duration in Hours	**20**

Unit 4: Entrepreneurial Skills – III				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Describe the significance of entrepreneurial values and attitude.	• Values in general and entrepreneurial values. Entrepreneurial value orientation with respect to inattentiveness, independence, outstanding performance and respect for work.	• Listing of entrepreneurial values by the students. • Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur. • Exhibiting entrepreneurial values in Ice breaking, rapport building, group work and home assignments.	10
2.	Demonstrate the knowledge of attitudinal changes required to become an entrepreneur.	• Attitudes in general and entrepreneurial attitudes • Using imagination/ intuition • Tendency to take moderate risk • Enjoying freedom of expression and action • Looking for economic opportunities • Believing that we can change the environment • Analyzing situation and planning action • Involving in activity	• Preparing a list of factors that influence attitude in general and entrepreneurial attitude. • Demonstrating and identifying own entrepreneurial attitudes during the following micro lab activities like thematic appreciation test. • Preparing a short write-up on "who am I". • Take up a product and suggest how its features can be improved. • Group activity for suggesting brand names, names of enterprises, etc.	15
			Total Duration in Hours	**25**

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

Part B: Vocational Skills

Class XI

Unit No.	Class XI, Unit Name	Duration in Hours
Unit 1	Software Construction Essentials	30
Unit 2	Operating System and Computer Network	25
Unit 3	Data Structure	20
Unit 4	Python Programming	60
Unit 5	Database Management System	30
	Total Duration	**165**

Unit 1: Software Construction Essentials				
Sn	**Learning Outcome**	**Theory (15 Hours)**	**Practical (15 Hours)**	**30 Hrs**
1.	Describe computer architecture	• Introduction to computer • Input/Output devices • Computer memory and its types • Introduction to digital electronics – Number systems and binary codes	• Draw the block diagram of computer system • Draw the connectivity diagram of various I/O devices • Practice inter conversion of number system	5

		• Data representation	• Practice conversion of real life data into binary codes, • Demonstrate to represent the real life data in computer memory	
2.	Describe the basic concepts of Mathematics and statistics	• Basic discrete mathematics • Concepts of sets, relations and functions • Mathematical logic • Group theory • Counting theory • Probability • Graph theory • Boolean Algebra • Statistical methods: mean, median, standard deviation, variance; • Data interpretation; visualization of data.	• Draw the logic diagram and truth table for logic gates • State and prove laws of Boolean algebra, • Compute probability • Determine the mean, mode, standard deviation and variance for the given data, • Draw the bar graph and pie chart graph fro the given data	7
3.	Solve the problem using problem solving method	• Introduction to problem Solving: problem solving cycle - analyzing a problem, designing algorithm, implementation through coding, testing the solution • Algorithms : what is an algorithm, need of algorithm in problem solving, characteristics of algorithm, representation of algorithm using flowchart/ swimlane	• Draw flowchart of problem solving cycle, • Write algorithm for computation of Fibonacci series • Draw flowchart for the given algorithm, • Write algorithm for swapping of numbers, • Draw flowchart for the given algorithm, • Draw swimlane diagram to describe the workflow for the given problem	10
4.	Describe programming language concepts	• Concept of a program, need for writing programs, process of conceptualizing a solution to a problem and moving from algorithm to programming, • Programming Constructs: Sequence, Selection and Iteration; Simulation (dry run) of program, • Introduction to compiler and interpreter, • Programming approaches – procedural oriented and object	• Write the steps for solving a given problem • Draw the syntax graph for selection and iteration • Differentiate between compiler and interpreter • Differentiate between procedure oriented and object oriented languages, • Select the programming language based on the requirement of project, • Demonstrate to use various	8

		oriented programming languages • Selection of programming language • Introduction to coding environment	program coding environment tools.	
			Total Duration in Hours	**30**

Unit 2: Operating System and Computer Network				
Sn	**Learning Outcome**	**Theory (15 Hours)**	**Practical (10 Hours)**	**25 Hrs**
1.	Describe the basic concept of operating system	• Concept of operating system, • Tasks/ jobs performed by the operating system, • Types of operating system, • Functions of operating system,	• List the names of operating system, • Execute the commands of operating system to perform given task.	6
2.	Describe computer networks	• Basic concepts of networking, • Types of network, • Network devices: Switch, Router, Gateway. • Network Topology, • Concept of client and server. • Basics of MAC and IP Address	• Identify and list the types of network, • Identify and list the network devices and their applications, • Draw the diagram of client server programming environment, • Fetch MAC and IP address of the system using OS commands	6
3.	Describe network protocol	• Wireless Technologies – Bluetooth, WLAN, Infrared, Microwave • Network Protocol: Need for Protocol, Categorization • Examples of protocol, HTTP, FTP, IP, PPP, SMTP, POP (email services)	• Demonstrate the installation and use of wireless devices in a network, • Exercise FTP, HTTPS using OS commands, • Configure mailbox on computer or mobile device	7
4.	Implement network security	• Threats and prevention: Viruses, Worms, Trojan horse, Spam, Cookies, Adware, Firewall, http vs https • Network Security Concepts: Firewall, Cookies, Hackers and Crackers • Antivirus and their workings • Network security threats: Denial of service, Intrusion problems, Snooping, Eavesdropping	• Identify and list various threats • List the preventive processes to tackle threats, • Identify the various firewall operations, • Clean your computer using antivirus or defender,	6
			Total Duration in Hours	**25**

Unit 3: Data Structure				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (10 Hours)**	**20 Hrs**
1.	Describe the concepts of data structure	• Introduction data structure, • Introduction to stack (LIFO Operations), • Operations on stack (PUSH and POP). • Introduction to Queue (FIFO), • Operations on Queue (INSERT and DELETE)	• List the various types of data structures, • Write algorithm to perform PUSH and POP operations on Stack, • Write algorithm to perform Insert and Delete operations on Queue	10
2.	Describe List and linked list	• Introduction to list, • Operations on list – searching, sorting, insertion, deletion and updation, • Introduction to linked list, • Operations on linked list – searching, sorting, insertion, deletion and updation, • Introduction to tree, • Operations on tree – searching, sorting, insertion, deletion and updation,	• Write algorithm to perform searching, sorting, deletion and update operation on List • Write algorithm to perform searching, sorting, deletion and update operation on Linked List, • Write algorithm to perform searching, sorting, deletion and update operation on Tree	10
			Total Duration in Hours	**20**

Unit 4: Python Programming				
Sn	**Learning Outcome**	**Theory (20 Hours)**	**Practical (40 Hours)**	**60 Hrs**
1.	Code and execute simple programs using Python	• Basics of Python programming, • Working with Python interpreter in interactive mode and script mode, • Structure of a program, debugging-errors, • Identifiers, keywords, constants, variables, • Types of operators, precedence of operators, • Data types, mutable and immutable data types, • Statements, expressions, evaluation and comments, • Input and output statements, • Data type conversion, debugging	• Install the python compiler (binaries) • List the various components of python interface, • Draw the diagram of structure of python program, • Write, compile and execute a simple program in python, • Write the rules for identifiers, constants and variables, • Write, compile and execute simple programs in python that uses constants, variables, operators and I/O statements • Write, compile and execute programs for data type conversion in python.	10
2.	Code and execute programs using	• Control structures: Sequence, selection (decision) and	• Write, compile and execute programs using sequence	20

	control structures	repetition (iteration) • Selection: if, if-else, and nested if statement, indentation • Repetition: for, while, and nested loops, break, continue;	selection and repetition, • Write, compile and execute programs using if, if-else, and nested if statement, • Write, compile and execute programs using for, while, and nested loops, break, continue.	
3.	Code and execute programs using Functions	• Introduction to functions, need of functions • User defined functions: passing arguments to a function, returning values from functions, scope of variables, • Standard library: using built-in functions, importing modules-math, random, statistics, creating and importing user defined module	• Write, compile and execute programs using functions, • Write, compile and execute programs using user defined functions, • Write, compile and execute programs by passing arguments to a function and returning values from functions, • Write, compile and execute programs by using built-in functions.	15
4.	Use GUI framework for python	• Introduction to GUI, • Python libraries to create GUI, • About Tkinter, Widgets : Label, button, canvas, check button, combo box, radio, menu bar, notebook, list box, frame, frame button, entry, spin box, message box • Layout Management: pack, grid, place • Organizing Layout and Widgets	• Install Tkniter • Identify various panels and tools used in Tkinter • Configure database connection with GUI • Write, compile and execute the programs in python using GUI interfaces	15
			Total Duration in Hours	**60**

Unit 5: Database Management System				
Sn	**Learning Outcome**	**Theory (12 Hours)**	**Practical (18 Hours)**	**30 Hrs**
1.	Describe the database management concepts	• Introduction to database concepts, • Difference between database and file system, • Data organisation – Relational/ non relational data model: concept of domain, tuple, relation, keys - candidate key, primary key, alternate key, foreign key;	• List database functions • List the difference between database and file system, • Build the table to organise student data, • Identify the primary key, tuple, candidate key, alternate key, foreign key from the given table	8
2.	Describe Structured Query Language	• Advantages of using Structured Query Language, • Data Definition Language,	• List the advantages of using Structured Query Language, • List the various activities that	8

		• Data Query Language • Data Manipulation Language,	can be performed using DDL, DQL, DML	
3.	Create and process table	• Introduction to MySQL, • Creating a database using MySQL, • Data Types • Data Definition: CREATE TABLE, DROP TABLE, ALTER TABLE, • Data Query: SELECT, FROM, WHERE • Data Manipulation: INSERT, UPDATE, DELETE • SQL Single Row Functions, • Multiple Row/Aggregate Functions, • Querying and Manipulating Data using: GROUP BY, HAVING, ORDER BY • JOINs: Equi Join, Natural Join, • Sub-queries in SQL	• Install MySQL application, • Identify and use database work environment, • Create a student table in MySQL • Add column to in the table • Add record for 10 number of students in the table • List the students name starting with character D. • Count the the student from a class whose name starts with A and born in the month of February, • Execute queries and sub-queries on the given table to extract the required data from multiple tables	14
			Total Duration in Hours	**30**

CLASS 12

Part A: Employability Skills

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

Unit 1: Communication Skills – IV				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Describe the steps to active listening skills	• Importance of active listening at workplace • Steps to active listening.	• Demonstration of the key aspects of becoming active listener. • Preparing posters of steps for active listening.	10
2.	Demonstrate basic writing skills	• Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	• Demonstration and practice of writing sentences and paragraphs on topics related to the subject.	15
			Total Duration in Hours	**25**

Unit 2: Self-management Skills – IV				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Describe the various factors influencing self-motivation	• Finding and listing motives (needs and desires); • Finding sources of motivation and inspiration (music, books, activities); expansive thoughts; living fully in the present moment; dreaming big.	• Group discussion on identifying needs and desire. • Discussion on sources of motivation and inspiration.	10
2.	Describe the basic personality traits,	• Describe the meaning of personality.	• Demonstrate the knowledge of different personality types.	

	types and disorders	• Describe how personality influence others. • Describe basic personality traits. • Describe common personality disorders- paranoid, antisocial, schizoid, borderline, narcissistic, avoidant, dependent and obsessive.		15
			Total Duration in Hours	**25**

Unit 3: Basic ICT Skills – IV				
Sn	**Learning Outcome**	**Theory (06 Hours)**	**Practical (14 Hours)**	**20 Hrs**
1.	Perform tabulation using spreadsheet application	• Introduction to spreadsheet application, • Spreadsheet applications, • Creating a new worksheet, • Opening workbook and entering text, • Resizing fonts and styles, • Copying and moving, • Filter and sorting, • Formulas and functions, • Password protection, • Printing a spreadsheet, • Saving a spreadsheet in various formats.	• Demonstration and practice on the following: • Introduction to the spreadsheet application, • Listing the spreadsheet applications, • Creating a new worksheet, • Opening the workbook and enter text, • Resizing fonts and styles, • Copying and move the cell data, • Sorting and Filter the data, • Applying elementary formulas and functions, • Protecting the spreadsheet with password, • Printing a spreadsheet, • Saving the spreadsheet in various formats.	10
2.	Prepare presentation using presentation application	• Introduction to presentation, • Software packages for presentation, • Creating a new presentation, • Adding a slide, • Deleting a slide, • Entering and editing text, • Formatting text, • Inserting clipart and images, • Slide layout, • Saving a presentation, • Printing a presentation document.	• Demonstration and practice on the following: • Listing the software packages for presentation, • Explaining the features of presentation, • Creating a new presentation, • Adding a slide to presentation, • Deleting a slide, • Entering and edit text, • Formatting text, • Inserting clipart and images, • Sliding layout,	10

			• Saving a presentation, • Printing a presentation document.	
			Total Duration in Hours	**20**

Unit 4: Entrepreneurial Skills – IV				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (15 Hours)**	**25 Hrs**
1.	Identify the general and entrepreneurial behavioral competencies	• Barriers to becoming entrepreneur. • Behavioral and entrepreneurial competencies – adaptability/ decisiveness, initiative/perseverance, interpersonal skills, organizational skills, stress management, valuing service and diversity.	• Administering self-rating questionnaire and score responses on each of the competencies. • Collect small story/ anecdote of prominent successful entrepreneurs. • Identify entrepreneurial competencies reflected in each story and connect it to the definition of behavioral competencies. • Preparation of competency profile of students.	10
2.	Demonstrate the knowledge of self-assessment of behavioral competencies	• Entrepreneurial competency in particular: self-confidence, initiative, seeing and acting on opportunities, concern for quality, goal setting and risk taking, problem solving and creativity, systematic planning and efficiency, information seeking, persistence, influencing and negotiating, team building.	• Games and exercises on changing entrepreneurial behavior and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and creativity.	15
			Total Duration in Hours	**25**

Unit 5: Green Skills – IV				
Sn	**Learning Outcome**	**Theory (05 Hours)**	**Practical (10 Hours)**	**15 Hrs**
1.	Identify the role and importance of green jobs in different sectors	• Role of green jobs in toxin-free homes. • Green organic gardening, public transport and energy conservation, • Green jobs in water	• Listing of green jobs and preparation of posters on green job profiles. • Prepare posters on green jobs.	15

		conservation. • Green jobs in solar and wind power, waste reduction, reuse and recycling of wastes, • Green jobs in green tourism • Green jobs in building and construction. • Green jobs in appropriate technology. • Role of green jobs in Improving energy and raw materials use • Role of green jobs in limiting greenhouse gas emissions • Role of green jobs minimizing waste and pollution • Role of green jobs in protecting and restoring ecosystems • Role of green jobs in support adaptation to the effects of climate change		
			Total Duration in Hours	**15**

Class XII, Part B: Vocational Skills

Sn	Class XII, Units	Duration in Hours
Unit 1	Software Engineering	30
Unit 2	Advanced Python Programming	50
Unit 3	Web application Development	40
Unit 4	Mobile Application Development	35
Unit 5	Emerging Trends and Social Impact	10
	Total Duration	**165**

Unit 1: Software Engineering				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (20 Hours)**	**30 Hrs**
1.	Describe the concepts of software engineering	• Concept of software engineering • Phases of software development – requirement analysis, system analysis, system design, system implementation, system maintenance • Managing information systems	• Draw a diagram of phases of software life cycle • Prepare the sample software requirement specification document of a given case study.	8

2.	Test and release of software	• Concept of software testing, • Different types of software testing, • Releasing software, concept of beta version, final version	• Prepare the sample test use cases for a given case study.	7
3.	Implement minor software project using python	• Minor projects such as financial system, college management system, library management system to be implemented by using python.	• Develop minor project based on SRS for a given case study using python. • Document the given project and prepare the project report	15
			Total Duration in Hours	**30**

Unit 2: Advanced Programming using Python				
Sn	**Learning Outcome**	**Theory (20 Hours)**	**Practical (30 Hours)**	**50 Hrs**
1.	Code and execute python programs using Strings	• Strings: initializing strings and accessing strings, • String operations, • Built-in functions for string manipulation, • String traversal, • String as argument to function	• Write, compile and execute the programs in python by using built in functions for strings, • Write, compile and execute the programs in python by using built in functions for String operations, • Write, compile and execute the programs in python by using built in functions for for string manipulation, • Write, compile and execute the programs in python by using built in functions for String traversal, • Write, compile and execute the programs in python by using built in functions for String as argument to function	8
2.	Code and execute python programs using List	• List, list operations - creating, initializing, traversing and manipulating lists, list methods, • Built-in functions, nested lists, list as argument to a function	• Write, compile and execute the programs in python for operations - creating, initializing, traversing and manipulating lists, • Write, compile and execute the programs in python for built-in functions for list, • Write, compile and execute the programs in python for	10

			nested lists, • Write, compile and execute the programs in python for list as argument to a function	
3.	Code and execute python programs using Tuples and Dictionary	• Tuples: Creating, initializing, accessing elements, tuple assignment, • Operations on tuples, • Tuple methods and built-in functions, nested tuples. • Dictionary: concept of key-value pair, mutability, creating, initializing, traversing, updating and deleting elements; • Dictionary methods and built-in functions.	• Write, compile and execute the programs in python for Creating, initializing, accessing elements and tuple assignment, • Write, compile and execute the programs in python for performing operations on tuples, • Write, compile and execute the programs in python for built-in functions, • Write, compile and execute the programs in python for nested tuples. • Write, compile and execute the programs in python for creating, initializing, traversing, updating and deleting elements from a dictionary; • Write, compile and execute the programs in python by using built-in functions for operations on dictionary.	8
4.	Handle Exception and File in Python	• File Handling: text file and binary file, file types, open and close files, • Reading and writing text files, • Reading and writing binary files using pickle module, • File access modes. • Exception Handling: syntax errors, exceptions, need of exception handling, • User-defined exceptions, • Raising exceptions, • Handling exceptions, • Catching exceptions, • Try - except – else clause, • Try - finally clause, • Recovering and continuing with finally, built-in exception classes.	• Write, compile and execute the programs in python to create a text file and binary file, • Write, compile and execute the programs in python to read the contents of existing file and to write the new contents in the text file, • Write, compile and execute the programs in python to read the contents of existing file and to write the new contents in the binary file, • Write, compile and execute the programs in python to handle exceptions, • Write, compile and execute the programs in python by	12

			using Try - except – else clause, • Write, compile and execute the programs in python by using Try - finally clause, • Write, compile and execute the programs in python by using built-in exception classes.	
5.	Implement data structure using python	• Stack and list implementation using python • Push and POP POP operation using python • Queue implementation using python • Insert, delete operations on Queue using python • Sequential and binary search using python • Bubble sort and selection sort using python • Hashing function using python.	• Write, compile and execute the programs in python for implementation of Stack and List data structure • Write, compile and execute the programs in python for Push and POP operation on Stack data structure, • Write, compile and execute the programs in python for implementation of Queue data structure, • Write, compile and execute the programs in python for Insert, delete operations on Queue data structure, • Write, compile and execute the programs in python for Sequential and binary search • Write, compile and execute the programs in python for Bubble sort and selection sort • Write, compile and execute the programs in python for for Hash function.	12
			Total Duration in Hours	**50**

Unit 3: Web Application Development				
Sn	**Learning Outcome**	**Theory (10 Hours)**	**Practical (30 Hours)**	**40 Hrs**
1.	Create web page using basic HTML and CSS	• HTML basic structure, • HTML Tags – <Head>, <Title>, <Body>, <P>, <A>, <Img>, <H1> to <H6> • iFrames, Colors, Tables, Fonts, Forms • List – ordered and unordered list • Embed Multimedia	• Create simple web pages using various tags for your school displaying various activities of the school along with relevant images, • Create a web page to display the marks scored by all students belonging to different classes of your school,	10

		• Simple HTML programs • Cascaded Style Sheets • Meta tags • Google forms	• Create a web page to display the list of items in ordered form and unordered form, • Create a web page to display the headings in different styles by using CSS.	
2.	Create web pages using scripting language	• Building dynamic web pages • Introductions to Scripting • Javascript, node js, • Web themes	• Build a dynamic web page for data validation • Build a dynamic web page for Fibonacci Table • Build a dynamic web page for your school/class where the current activities going on the school campus are displayed	10
3.	Create web forms	• Form Elements – Text, Combo box, Lists, radio buttons, • Action Buttons – onClick, onMouseOut, onMouseOver, • Database connection • Basic data operations using forms – Insert, Update, Delete records • Report generation in text format • Report generation in chart based format	• Create a simple web page of bank where user is permitted to open account number, also display the balance amount in the saving account of the existing customers, • Create a web page to prepare the online admission form of your school, • Create a web page that generate sales report in text format and chart based format.	10
4.	Implement web application project using python and HTML	• Procedure for building simple web based application for basic calculator functionality	• Build simple web based application for basic calculator functionality using python and HTML	10
			Total Duration in Hours	**40**

Unit 4: Mobile Application Development				
Sn	**Learning Outcome**	**Theory (15 Hours)**	**Practical (20 Hours)**	**35 Hrs**
1.	Describe mobile computing essentials	• Introduction to Mobile Computing • Introduction Android Development Environment • Frameworks and tools • Application wire framing • Generic User Interface (UI) development	• Observe various menus in Android Development Environment • Observe and practice frameworks and tools • Observe and practice GUI development	8
2.	Build simple mobile	• Android intents and services	• Develop simple Apps for simple	8

	applications	• Storing and retrieving of data • Communication via network and web • Notification and alarms • Android Graphics and multimedia	calculator, calendar, dictionary, • Develop App for your school library,	
3.	Integrate with mobile services	• Integration of location based services • Integration with native mobile services (SMS, Contact List, etc)	• Develop App to trance your location, find you train etc. • Develop App for authenticity verification through SMS	8
4.	Develop a simple project	• Procedure for designing and building basic android application, • Procedure for testing application for various mobile screens	• Design and Build basic android application for recording attendance of students in class, • Testing your developed application for various mobile screens	11
			Total Duration in Hours	**35**

Unit 5: Emerging Trends and Social Impact				
Sn	**Learning Outcome**	**Theory (8 Hours)**	**Practical (2 Hours)**	**10 Hrs**
1.	Describe Emerging Trends and new Technologies	• Machine Learning and Artificial intelligence • Internet of Things • Cyber Security • Block Chain • Social Engineering • Data Analytics	• Discuss the concepts of Machine Learning and Artificial intelligence, Internet of Things, Cyber Security, Block Chain, Social Engineering, Data Analytics	5
2	Describe Socio Impact on Technology	• Impact on Health • Cyber Crime • Privacy • Copyright and Intellectual Property • IT Act of India • Carbon Footprints	• Discuss the Impact on Health, Cyber Crime, Privacy, Copyright and Intellectual Property, IT Act of India, Carbon Footprints	5
			Total Duration in Hours	**10**

6. ORGANISATION OF FIELD VISITS and OJT

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. During summer or winter vacation, students can undergo one week on-the-job training in nearby industry or work place.

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 Software Development company and observe the following: Location, Site, Work culture, IT practices. During the visit, students should obtain the following information from the management of the organisation :

- Vision and mission of the organisation
- Services and technologies offered by the organisation
- Working environment of IT personals
- Corporate Sustainability Initiative
- Global footprints
- Opportunities to work with organisation
- Campus overview, green initiatives,
- Know the advanced technology in software development.

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.
Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software)
Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning
White Board, Markers and Eraser
Projector with screen
Flip chart with markers
Faculty's PC/Laptop with latest configuration and internet connection
Supporting software / applications for projecting audio, video, recording,
Presentation Tools to support learning activities:
Intranet, Email
Learning management system e.g. Moodle, Blackboard to enable blended learning
Microphone / voice system for lecture and class activities
Handy Camera
Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets
For IT Lab sessions:
Computer Lab with 1:1 PC : trainee ratio and having internet connection, Browser, Email Client and chat tools.
Peripherals and Network devices,
Printers

Operating System and Utility softwares
Assessment and Test Tools for day to day online Tests and Assessments

For team discussions:

Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition.

Reading Resources:

Access to relevant sample documents and learning forums to enable self-study before and after each training session.

8. TEACHER'S/TRAINER'S QUALIFICATION

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

S.No.	Qualification	Minimum Competencies	Age Limit
1	Bachelor of Engineering / Technology in Computer Science / Technology **OR** Master of Computer Science **OR** Master of Computer Application **OR** Master of Information Technology **OR** DOEACC B Level Certificate. **Desirable:** Knowledge of Software Development.	The candidate should have a minimum of 1 year of work experience in the same job role. S/He should be able to communicate in English and local language. S/He should have knowledge of equipment, tools, material, Safety, Health & Hygiene.	18-37 years (as on Jan. 01 (year)) Age relaxation to be provided as per Govt. rules

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

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

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

1. Directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education(PSSCIVE), NCERT or the respective Sector Skill Council(SSC). **OR**
2. Through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

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

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

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

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

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

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

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

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

- Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
- Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
- Make effective use of learning aids and ICT tools during the classroom sessions;
- Engage students in learning activities, which include a mix of different methodologies, such as project based work, team work, practical and simulation based learning experiences;
- Work with the institution's management to organise skill demonstrations, site visits, on-job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
- Identify the weaknesses of students and assist them in up-gradation of competency;
- Cater to different learning styles and level of ability of students;
- Assess the learning needs and abilities, when working with students with different abilities
- Identify any additional support the student may need and help to make special arrangements for that support;
- Provide placement assistance

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

- Participation in guidance and 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;
- Involvement in placement of students/student support services.

9. LIST OF CONTRIBUTORS

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