LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE:
Telecom Technician – IoT Device/ Systems

(QUALIFICATION PACK: Ref. Id. TEL/Q6210)

NSQF Level 4

SECTOR: Telecom

Grades XI and XII

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

Joint Director

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

FOREWORD

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE) a constituent of the National Council of Educational Research and Training (NCERT) is spearheading the efforts of developing learning outcome based curricula and courseware aimed at integrating both vocational and general qualifications to open pathways of career progression for students. It is a part of Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education (CSSVSHSE) launched by the Ministry of Education, 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 **Teleom Technician – IoT Device / Systems**. 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.

Dinesh Prasad Saklani
Director
National Council of Educational Research & Training

PREFACE

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

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

The PSSCIVE firmly believes that the vocationalisation of education in the nation need to be established on a strong footing of philosophical, cultural and sociological traditions and it should aptly address the needs and aspirations of the students besides meeting the skill demands of the industry. The curriculum, therefore, aims at developing the desired professional, managerial and communication skills to fulfill the needs of the society and the world of work. In order to honor its commitment to the nation, the 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 course-ware for over 100 job roles in various sectors.

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

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

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

Deepak Paliwal
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 Education (MoE), 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, MoE, RMSA Cell at the National Council of Educational Research and Training (NCERT), National Skill Development Agency (NSDA) and National Skill Development Corporation (NSDC) and Electronics Sector Skill Council of Indian (ESSCI) for their academic support and cooperation.

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

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

PSSCIVE Team

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1. COURSE OVERVIEW

COURSE TITLE: Telecom Technician – IoT Device/ Systems

The Internet of Things (IoT) has been instrumental in reshaping the telecommunications industry, creating a paradigm shift in the technological landscape. Telecom providers play a crucial role in supporting IoT solutions. IoT holds immense promise for telecom operators, offering numerous opportunities and advantages that can revolutionize the telecommunications market. IoT seamlessly connects billions of devices and enables the exchange of data on a global scale.

The individual in this job role is responsible for on-site installation and configuration of IoT Devices (nodes), setting up of communication links between nodes and controller (gateway) and further to central servers or devices through external communication links on WiFi, 4G or 5G networks. The individual should also be able to adapt to new technologies, have attention to details and be an out of box thinker. They are responsible for first level of DI or DR. They should have good analytical, problem solving and effective communication skills. They are responsible for attending to customer complaints, installing newly purchased products, troubleshooting system problems and, configuring peripherals such as printers, scanners and network devices. They should have ability to build interpersonal relationships and critical thinking. They must be willing to travel to client premises in order to attend to calls at different locations.

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

- ✓ Apply effective oral and written communication skills to interact with customers;
- ✓ Identify the principal components of a computer system;
- ✓ Demonstrate the basic skills of using computer;
- ✓ Demonstrate self-management skills;
- ✓ Demonstrate the ability to provide a self-analysis in context of entrepreneurial skills;
- ✓ Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
- ✓ Describe the duties and responsibilites of Telecom Technician – IoT Devices;
- ✓ Install and configure IoT devices at customer premises,
- ✓ Perform preventive and corrective maintenance,
- ✓ Arrange tools and spares,
- ✓ Record and document maintenance status,
- ✓ Perform level 1 troubleshooting of IoT devices,
- ✓ Organize work and resources as per health and safety standards,
- ✓ Describe inclusive communication, interpersonal skills, and sensitization towards gender and persons with disability (PwD).

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

COURSE LEVEL: This course can be taken up at Intermediate level in Grade XI and Grade XII.

COURSE DURATION: **Total : 600 hours**

Grade 11 : 300 hours

Grade 12 : 300 hours

2. SCHEME OF UNITS AND ASSESSMENT

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

GRADE XI			
	Units	**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory & Practical 100**
Part A	**Employability Skills**		
Unit 1	Communication Skills – III	20	**10**
Unit 2	Self-management Skills – III	15	
Unit 3	Basic ICT Skills – III	20	
Unit 4	Entrepreneurial Skills – III	20	
Unit 5	Green Skills – III	15	
	Total Hours	**90**	**10**
Part B	**Vocational Skills**		
Unit 1	IoT Devices and Systems	60	**40**
Unit 2	Installation of IoT Devices	60	
Unit 3	Occupational Health and Safety Standards	30	
	Total Hours	**150**	**40**
Part C	**Field Visits (3x5)**	**15**	**10**
Part D	**On the Job Training and Field Visits (3x5)**	**45**	
Part E	**Project/ Practical Work**		
	Practical File/ Student Portfolio		10
	Practical Work		10
	Written Test		10
	Viva Voce		10
	Total		**40**
	Total Hours	**300**	**100**

The unit-wise distribution of hours and marks for **Grade XII** is as follows:

GRADE XII			
	Units	**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory & Practical 100**
Part A	**Employability Skills**		
Unit 1	Communication Skills – III	20	**10**
Unit 2	Self-management Skills – III	15	
Unit 3	Basic ICT Skills – III	20	
Unit 4	Entrepreneurial Skills – III	20	
Unit 5	Green Skills – III	15	
	Total Hours	**90**	**10**
Part B	**Vocational Skills**		
Unit 1	Setup and Configuration of IoT Devices	60	**40**
Unit 2	Level 1 Troubleshooting of IoT devices	60	
Unit 3	Organisational Processes and Standards	30	
	Total Hours	**150**	**40**
Part C	**Field Visits (3x5)**	**15**	**10**
Part D	**On the Job Training and Field Visits (3x5)**	**75**	
Part E	**Project/ Practical Work**		
	Practical File/ Student Portfolio		10
	Practical Work		10
	Written Test		10
	Viva Voce		10
	Total		**40**
	Total Hours	**300**	**100**

3. TEACHING/TRAINING ACTIVITIES

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

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

CLASSROOM ACTIVITIES

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

PRACTICAL WORK IN LABORATORY/WORKSHOP

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

FIELD VISITS/ EDUCATIONAL TOUR

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

4. ASSESSMENT AND CERTIFICATION

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

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

KNOWLEDGE ASSESSMENT (THEORY)

Knowledge Assessment should include two components: one comprising of internal assessment and second an external examination, including theory examination to be conducted by the Board. The assessment tools shall contain components for testing the knowledge and application of knowledge. The knowledge test can be objective paper based test or short structured questions based on the content of the curriculum.

WRITTEN TEST

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

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

Duration: 3 hrs **Max. Mark: 30**

		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

GRADE XI, Part A: Employability Skills

Unit No.	Unit Name	Duration in Hours
Unit 1	Communication Skills – III	20
Unit 2	Self-management Skills – III	15
Unit 3	Basic ICT Skills – III	20
Unit 4	Entrepreneurial Skills – III	20
Unit 5	Green Skills – III	15
	Total	**90**

Unit 1: Communication Skills – III				
Sn	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20**
1	Demonstrate knowledge of communication	• Introduction to communication • Importance of communication • Elements of communication • Perspectives in communication • Effective communication	• Role-play on the communication process • Group discussion on the importance of communication and factors affecting perspectives in communication • Charts preparation on elements of communication • Classroom discussion on the 7Cs (i.e. Clear, Concise, Concrete, Correct, Coherent, Courteous and Complete) for effective communication	03
2	Demonstrate verbal communication	• Verbal communication • Public Speaking	• Role play of a phone conversation • Group activity on delivering a speech and practicing public speaking	02
3	Demonstrate non-verbal communication	• Importance of non-verbal communication, • Types of non-verbal communication, • Visual communication	• Role plays on non-verbal communication • Group exercise and discussion on Do's and Don'ts to avoid body language mistakes • Group activity on methods of communication	02
4	Demonstrate speech using correct	• Pronounciation basics, • Speaking poperly, • Phonetics,	• Group activities on practicing pronunciation	01

	pronunciation	• Types of sounds		
5	Apply an assertive communication style	• Important communication styles, • Assertive communication, • Advantages of assertive communication, • Practicing assertive communication	• Group discussion on communication styles, • Group discussion on observing and sharing communication styles	02
6	Demonstrate the knowledge of saying no	• Steps for saying "No" • Connecting words	• Group discussion on how to say 'No'	01
7	Identify and use parts of speech in writing	• Capitalisation, • Punctuation, • Basic parts of speech, • Supporting parts of speech	• Group activity on identifying parts of speech, • Writing a paragraph with punctuation marks, • Group activity on constructing sentences, • Group activity on identifying parts of speech	02
8	Write correct sentences and paragraphs	• Parts of a sentence • Types of object • Types of sentences • Paragraph	• Activity on framing sentences • Activity on active and passive voice • Assignment on writing different types of sentences.	01
9	Communicate with people	• Geetings, • Introducing self and others	• Role-play on formal and informal greetings, • Role-play on introducing someone, • Practice and group discussion on how to greet different people	01
10	Introduce yourself to others and write about oneself	• Talking about self • Filling a form	• Practicing self-introduction and filling up forms • Practicing self-introduction to others	01
11	Develop questioning skill	• Main types of questions, • Forming closed and open ended questions	• Practice exercise on forming questions, • Group activity on framing questions.	01
12	Communicate information about family to others	• Names of relatives, • Relations	• Practice taking about family, • Role-ply on talking about family members	01
13	Describe habits and routines	• Concept of habits and routines	• Group discussion on habits and routines • Group activity on describing routines	01

14	Ask or give directions to others	• Asking for directions, • Using landmarks	• Role-play on asking and giving directions, • Identifying symbols used for giving directions	01
			Total Duration in Hours	**20**

Unit 2: Self-management Skills – III				
Sn	**Learning Outcome**	**Theory (07 Hours)**	**Practical (08 Hours)**	**15**
1.	Identify and analyze own strengths and weaknesses	• Understanding self • Techniques for identifying strengths and weaknesses • Difference between interests and abilities	• Activity on writing aims in life • Prepare a worksheet on interests and abilities	02
2.	Demonstrate personal grooming skills	• Guidelines for dressing and grooming • Preparing a personal grooming checklist	• Role-play on dressing and grooming standards • Self-reflection activity on various aspects of personal grooming	02
3.	Maintain personal hygiene	• Importance of personal hygiene • Three steps to personal hygiene • Essential steps of hand washing	• Role-play on personal hygiene • Assignment on personal hygiene	02
4.	Demonstrate the knowledge of working in a team and participating in group activities	• Describe the benefits of teamwork, • Working in a team	• Assignment on working in a team, • Self-reflection on teamwork	02
5	Develop networking skills	• Benefits of networking skills, • Steps to build networking skills	• Group activity on networking in action, • Assignment on networking skills	01
6	Describe the meaning and importance of self-motivation	• Meaning of self-motivation, • Types of motivation, • Steps to building self-motivation	• Activity on staying motivated, • Assignment on reasons hindering motivation	02
7	Set goals	• Meaning of goals and purpose of goal-setting, • Setting SMART goals	• Assignment on setting SMART goals, • Activity on developing long-term and short-term goals using SMART method	02
8	Apply time management strategies and techniques	• Meaning and importance of time management, • Steps for effective time management	• Preparing checklist of daily activities	02
			Total Duration in Hours	**15**

Unit 3: Information and Communication Technology Skills – III				
Sn	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20**
1.	Create a document on the word processor	• Introduction to ICT, • Advantages of using a word processor, • Work with LibreOffice Writer	• Demonstration and practice of the following: • Creating a new document • Typing text • Saving the text • Opening and saving file in Microsoft word/Libre Office Writer	02
2.	Identify icons on the toolbar	• Status bar, • Menu bar, • Icons on the Menu bar, • Multiple ways to perform a function	• Group activity on using basic user interface of LibreOffice writer • Group activity on working with Microsoft Word	02
3.	Save, close, open and print document	• Save a document, • Close a document, • Open an existing document, • Print a document	• Group activity on perform ing the functions for saving, closing and printing documents in LibreOffice Writer, • Group activity on perform ing the functions to save, close and print documents	02
4.	Format text in a document	• Change style and size of text • Align text, • Cut, Copy, Paste, • Find and replace	• Group activity on formatting text in LibreOffice Writer, • Group activity on formatting text in Microsoft Word	02
5.	Check spelling and grammar in a word document	• Use of spell checker, • Autocorrect	• Group activity on checking spellings and grammer using LibreOffice Writer • Group activity on checking spellings and grammer using Microsoft Word	02
6.	Insert lists, tables, pictures, and shapes in a word document	• Insert bullet list, • Number list, • Tables, • Pictures, • Shapes	• Practical exercise of inserting lists and tables using LibreOffice Writer	03
7.	Insert header, footer and page number in a word document	• Insert header, • Insert footer, • Insert page number, • Page count	• Practical exercise of inserting header, footer and page numbers in LibreOffice Writer • Practical exercise of inserting header, footer and page numbers in Microsoft Word	03
8.	Make changes by using the track change option in a	• Tracking option • Manage option • Compare documents	• Group activity on performing track changes in LibreOffice Writer	04

	word document		• Group activity on performing track changes in Microsoft Word	
			Total Duration in Hours	**20**

Unit 4: Entrepreneurial Skills – III				
Sn	**Learning Outcome**	**Theory (07 Hours)**	**Practical (13 Hours)**	**20**
1.	Differentiate between different kinds of businesses	• Introduction to entrepreneurship • Types of business activities	• Role play on different kind of business around us	02
2.	Describe the significance of entrepreneurial values	• Meaning of value, • Values of an Entrepreneur, • Case study on qualities of an entrepreneur	• Role play on qualities of an Entrepreneur	02
3.	Demonstrate the attitudinal changes required to become an entrepreneur	• Difference between the attitude of entrepreneur and employee	• Interviewing employees and entrepreneurs	02
4.	Develop thinking skills like an entrepreneur	• Problems of entrepreneurs • Problem-solving, • Ways to think like an entrepreneur	• Group activity on identifying and solving problems	03
5.	Generate business ideas	• The business cycle, • Principles of idea creation, • Generating a business idea, • Case studies	• Brainstorming on generating a business ideas	03
6.	Describe customer needs and importance of conducting a customer survey	• Understanding customer needs • Conducting a customer survey	• Group activity to conduct a customer survey	04
7.	Create a business plan	• Importance of business planning, • Preparing a business plan, • Principles to follow for growing a business, • Case studies	• Group activity on developing a business plan	04
			Total Duration in Hours	**20**

Unit 5: Green Skills – III				
Sn	**Learning Outcome**	**Theory (07 Hours)**	**Practical (08 Hours)**	**15**
1.	Describe the importance of the main sector of the	• Meaning of ecosystem, food chain and sustainable development	• Group discussion on sectors of green economy, • Poster making on various sectors	06

	green economy	• Main sectors of the green economy- E-waste management, green transportation, renewal energy, green construction, and water management	for promoting green economy	
2.	Describe the main recommendations of policies for the green economy	• Policies for a green economy	• Group discussion on initiatives for promoting the green economy, • Writing an essay or a short note on the important initiatives for promoting green economy.	03
3.	Describe the major green sector/area and the role of various stakeholders in the green economy	• Stakeholders in the green economy	• Group discussion on the role of stakeholders in green economy • Preparation of posters on green sectors and their stakeholders • Making solar bulbs.	03
4.	Identify the role of government and private agencies in the green economy	• Role of the government in promoting a green economy, • Role of private agencies in promoting green economy	• Group discussion on the role of Government and Private Agencies in promoting a green economy. • Posters making on green sectors.	03
			Total Duration in Hours	**15**

GRADE XI, Part B: Vocational Skills

Unit No.	Unit Name	Duration in Hours
Unit 1	IoT Devices and Systems	60
Unit 2	Installation of IoT Devices	60
Unit 3	Occupational Health and Safety Standards	30
	Total Duration	**150**

Unit 1: IoT Device and System				
Sn	**Learning Outcome**	**Theory (30 Hours)**	**Practical (30 Hours)**	**60**
1.	Describe the role and responsibilities of Telecom Technician – IoT Devices and Systems	• Size and scope of the telecom industry and its various sub-sectors, • Telecom Equipment, Telecom Services, Wireless communication, • Role and responsibilities of Telecom Technician – IoT devices and systems,	• List the various subsectors of telecom industry, • Visit the telecom industry and observe the software, hardware, tools and equipment, • Evaluate the case studies and outline the role, responsibilities, and challenges for telecom	08

		• Skill set of Telecom Technician- IoT Devices/Systems, • Organisational policies on workplace ethics, • Process workflow, • Scope of work and future of Telecom Technician – IoT Devices/ Systems.	technician – iot devices and systems. • Prepare the chart showing the scope of work for Telecom Technician – IoT Devices/ Systems.	
2.	Describe the concept of Internet of Things (IoT)	• Internet of Things (IoT), • Devices and sensors, • Cloud Computing, • Networking connection, • IoT Gateway • Archetecture of IoT, • Applications of IoT – Smart homes, wearable devices, traffic monitoring, industrial internet, smart cities, agriculture, healthcare, • Mobile applications – Control App, Monitoring App, Configuration App, Health and Fitness App, Location-Based App, Automation App, Communication App	• Draw the diagram of internet of things showing the various components, • List the applications of internet of things, • Illustrate the famework of internet of things for roadside assistance services	08
3.	Describe the controller boards	• Microprocessor, • Microcontroller – Types and applications, • Comparision of microprocessor and microcontroller boards, • IoT development boards and categories, • Microprocessor boards – Arduino, Raspberry pi • Arduino board – Pin configuration, • Node MCU ESP8266 IoT enabled board – Pin configuration, • Raspberry Pi board – Pin configuration, • Comparison of various parameters of different controller Boards, • Programming of controller board, • Connectivity options for controller boards – Embedded	• Identify the various microprocessor boards • Draw the diagram of microprocessor boards and lable the parts – Arduino, Raspberry pi, • Identify the various parts of microcontroller, • Identify the pins in various microcontroller boards, • Demonstrate an experiment of LED blinking with Node MCU, • Demonstrate to set-up a simple Raspberry Pi LED circuit.	10

		Wi-Fi, Bluetooth, Low Power Wide Area Network, Embedded Wireless, ZigBee (802.15.4), • Optimization of the controller boards, • Connecting IP enabled and Non-IP enabled devices.		
4.	Describe the functioning of sensors and actuators	• Sensors and their usage in IoT, • Sensor classification – according to power or energy supply requirements of the sensor, according to output signal, according to various measurement objective, • Different types of sensors – Temperature sensors, Proximity sensors, Pressure sensors, Gyroscope sensors, Humidity sensors, Touch sensors, Reed sensor, Light sensor, Range sensor, Video surveillance, • Actuators, • Working of actuators. • Actuators classification - Pneumatic, Hydraulic, Electric, Magnetic and Thermal, Mechanical, • Difference between sensor and actuator, • Sensor calibration – calibration process of Temperature sensor with indicator, • Benefits of calibration sensor, • Nodes structure of sensor node, • Sensor connectivity in IoT	• List the various types of sensors, • Demonstrare to connect different types of sensors, • Demonstrate to test the temperature sensor TMP36 using a multimeter, • Demonstrate light sensing with a Light-Dependent Resistor (LDR)sensor, • Demonstrate the working of PIR motion sensor, • Illustrate the working of Remote-controlled LED using Wi-Fi-enabled smart plug	12
5.	Describe the Nodes, Gateways and Edge devices	• Introduction to Nodes, Gateways, and Edge devices, • Gateways in IoT – Architecture, Functions, Working, • Functions of Edge devices, • Types of Edge devices – Multiplexer, Routing switch, Local Area Network (LAN), Edge service provider, Edge data center, Edge device/node	• Identify the different types of edge devices, • Explore the edge devices.	08

6.	Describe the communication technology and protocols for IoT	• Transmission Control Protocol/ Internet Protocol (TCP/IP) • TCP/IP layers • IoT device connectivity – wired and wireless, • Factors affecting the communication, • Different types of IoT connections, • IoT network – cellular network, LPWAN (Low-Power Wide-Area Network), • Security and privacy, • Protocols and Standards – IoT network Protocols, IoT data protocols, • Network topologies – Point-to-Point, Star, Mesh topology, • Multiprotocol IoT environment.	• Identify and name the communication technologies, • Compare different communication technologies based on frequency and applications on a chart, • Identify and name the topologies.	08
7.	Describe the cloud computing	• Basics of cloud computing, • Characteristics of cloud computing, • Models of cloud computing – Deployment models, Service models, • Cloud optimization and business analytics, • Role of cloud computing in IoT, • Advantages of cloud in IoT, • IoT cloud framework.	• Demonstrate to design GAS level monitoring system using cloud.	06
			Total Duration in Hours	**60**

Unit 2: Installation of IoT Devices				
Sn	**Learning Outcome**	**Theory (30 Hours)**	**Practical (30 Hours)**	**60**
1.	Establish the Framework for Internet of Things	• Installing the IoT Framework, • Site preparation for installation of IoT devices, • Installation of sensor – points and location, mounting of sensor, sensor connectivity, installaton and configuration, • Input Parameters captured by sensors, • Collating installation points and collecting data,	• List the steps of installation of IoT framework, • Demonstrate to collect data, • List the input parameters for a sensor device • Demonstrate to install and configure a motion sensor in a controlled environment, • Demonstrate to install and connect IoT gateway for data aggregation,	12

		• Calibrating user data, • Installation of Gateways – location, connecting power source, connecting to internet, • Installation of Nodes, • Installation of home IoT system – block diagram, components of home IoT system, installation flow, • Test the installation.	• Demonstrate the steps of installation of the Home IoT system on personal mobile	
2.	Establish communication between Nodes Gateway and Servers	• Different types of communication and their applications, • Transmission media and its types, • Characteristics of Ethernet, • Types of Ethernet and standards – WLAN standards, • Connecting IoT devices to the network – crimping, connecting using wired Ethernet, using wi-fi, • Types of cables and connectors.	• Identify and name the various Physical Transmission Media, • List the distingushing features of Physical Transmission Media, • List the various transmission media, • List the distingushing features of Wireless Transmission Media, • Identify the cables and connectors, • Demonstrate the processof crimping RJ 45 cable, • Demonstrate to connect devices to the network	08
3.	Undertake pre-installation preparation of IoT devices	• Preinstallation preparation, • Requirement analysis and site requirements of IoT devices, • Creating of site log, • Location for Installing the device • Installation checklist, • General safety instructions for installation of IoT devices	• Illustrate to create the site log for installation of IoT device, • List the factors to choose the location for installing the IoT device, • List out the general safety instructions for installation of IoT devices, • Prepare Installation Checklist	08
4.	Select and use appropriate Tools and Equipment for Installation of IoT devices	• Tools required for installation of IoT devices – Drill bits, Torque wrench, Wire strippers, Crimpers, Needle-nose pliers, Wire cutter, Multimeter, Tape measure, Heavy duty extension cords, Fuse Pullers, Magnetic wristband, • Safe handling of hand tools and equipment.	• Demonstrate to use appropriate tools required for installation of IoT device, • Illustrate to use Multimeter to measure frequency, capacitance, decibels, inductance and temperature, • Illustrate to test a speed sensor using a multimeter, • Demonstrate the safety in handling tools and equipment.	08
5.	Mount the devices at desired	• Surface preparation and mounting devices,	• Prepare the surface for mounting devices,	08

	locations	• Steps for surface preparation while mounting devices, • Signal and power loss during inter-device communication, • Mounting of device, • Factors affect the signal between network devices – Physical obstructions, Network range and distance between devices, • Factors for IoT network, • Factors to be considered while selecting a Switch, Router, • Cabling and power connections.	• Identify the correct distance between the devices, • Identify the correct set of sources for power and other utilities, • Demonstrate to mount device and its components, • Draw the network diagram to set up for a LAN network, • Demonstrate to connect the cables in IoT framework, • Draw a diagram of wiring set up for a camera in IoT, • Make cabling and power connections.	
6.	Perform checks and connections of devices	• Connectivity between the devices, • Steps to check the connectivity between devices, • Preparation of devices for transmission of data, • Power supply and grounding, • Post commissioning tests.	• Illustrate to check the connectivity between devices, • Illustrate the preparation of devices for transmission of data, • Perform grounding of an electrical connection, • Create a checklist for the tests performed in testing IoT setup, • Test the speed of 3 wire speed sensors using a multimeter.	08
7.	Check the connections of devices	• Checking connectivity of devices, • Checking power supply and grounding, • Post commisioning test	• Identify the connectivity points in Arduino and Raspberry pi, • List the connectivity options available for microcontroller, • Demonstrate to check connectivity of a device to the microcontroller board.	08
			Total Duration in Hours	**60**

Unit 3: Occupational Health and Safety Standards				
Sn	**Learning Outcome**	**Theory (12 Hours)**	**Practical (18 Hours)**	**30**
1.	Maintain the self and workplace health and hygine to achieve optimum productivity	• Policies, procedures, standards and work ethics in telecom industry, • Importance of basic hygine practices, cleanliness, safety and tidy workplace, • Organisational hygiene and sanitation guidelines and procedure to report breaches	• List the common problems in telecom industry, • List the different methods of cleaning, disinfection, and sanitization, • Demonstrate to sanitize and disinfect work area, • Demonstrate the different approches to clean the tools,	10

		and gaps, • Different methods of cleaning, disinfection, sanitization • Importance of time management and quality to meet daily target,	equipment and machines, • Identify any spills and leaks that need to be plugged/stopped, • Demonstrate to wash, sanitizing hands using soap, water and alcohol-based hand rubs, • Prepare a time schedule to complete the tasks	
2.	Describe the workplace hazards and procedure to deal with hazards	• Different types of hazards, • Procedure to report it to the supervisor, • Correct postures while working and handling hazardous materials at workplace, • Precautionary steps to follow while handling hazardous materials, • Warning labels, symbols and other related signages, • Safety equipment – goggles, gloves, ear plugs, shoes, • PPE – face masks, hand gloves, face shields, PPE suits, • Self quarantine and isolation, • Emergency and Evacuation procedure	• List different types of hazards, • Sketch the procedure to report the hazards to the supervisor, • Demonstrate the correct postures while working and handling hazardous materials at workplace, • Demonstrate warning labels, symbols and other related signages, • Demonstrate to use safety equipment – goggles, gloves, ear plugs, shoes, • Demonstrate to wear and remove PPE – face masks, hand gloves, face shields, PPE suits, • Demonstrate to evacuate the workplace in emergency	10
3.	Optimise the use of resources and organizing waste management and recycling	• Optimum utilisation of resources, • Recyclable/non-recyclable and hazardous wastes, • Recycling as well as repairing and reusing electronic components, • Different waste categories –dry, wet, recyclable, non-recyclable and single use plastic items, • Waste management and waste disposal procedures, • Colour dustbins for different types of waste, • Common source of pollution and ways to minimize it, • Effect of greening of jobs	• Prepare a chart showing optimul utilisation of resources, • Identify and segregate non-recyclable/recyclable and hazardous wastes, • Group activity to dispose waste as per the procedures, • Group activity to recycle, repair and reuse components, • Demonstrate to use different disposal techniques for different types of waste, • Demonstrate the efficient utilization of material, water, • Demonstrate to use energy efficient electrical appliances and devices for energy conservation.	10
			Total Duration in Hours	**30**

GRADE XII, Part A: Employability Skills

Unit No.	Unit Name	Duration (Hrs.)
Unit 1	Communication Skills – IV	20
Unit 2	Self-management Skills – IV	15
Unit 3	Basic ICT Skills – IV	20
Unit 4	Entrepreneurial Skills – IV	20
Unit 5	Green Skills – IV	15
	Total Hours	**90**

Unit 1: Communication Skills – IV				
Sn	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20**
1.	Demonstrate active listening skills	• Active listening -listening skill, stages of active listening, • Overcoming barriers to active listening	• Group discussion on the factors affecting active listening, • Preparing posters of steps for active listening, • Role-play on negative effects of not listening actively	07
2.	Identify the parts of speech	• Parts of speech – using capitals, punctuation, basic parts of speech, supporting parts of speech	• Group practice on identifying parts of speech • Group practice on constructing sentences	07

3.	Write sentences	• Writing skills to practice the following:
		  • Simple sentence
		  • Complex sentence
		  • Types of object
		• Identify the types of sentences
		  • Active and Passive sentences
		  • Statement/Declarative sentence
		  • Question/Interrogative sentence
		  • Emotion/Reaction or Exclamatory sentence
		  • Order or Imperative sentence
			• Group activity on writing sentences and paragraphs,
			• Group activity on practicing writing sentences in active or passive voice,
			• Group activity on writing different types of sentences (i.e., declarative, exclamatory, interrogative and imperative)
				06

			Total Duration in Hours	**20**

Unit 2: Self-management Skills – IV				
Sn	**Learning Outcome**	**Theory (07 Hours)**	**Practical (08 Hours)**	**15**
1.	Describe the various factors influencing motivation and positive attitude	• Motivation and positive attitude • Intrinsic and extrinsic motivation • Positive attitude – ways to maintain positive attitude • Stress and stress management - ways to manage stress	• Role Play on avoiding stressful situation, • Activity on listing negative situations and ways to turn it positive	06
2.	Describe how to become result oriented	• How to become result oriented, • Goal setting – examples of result-oriented goals	• Pair and share activities on the aim of life	03

3.	Describe the importance of self-awareness and the basic personality traits, types and disorders	• Steps towards self-awareness
		• Personality and basic personality traits
		• Common personality disorders-
		  • Suspicious
		  • Emotional and impulsive
		  • Anxious
		• Steps to overcome personality disorders
			• Group discussion on self awareness
			• Group discussion on common personality disorders
			• Brainstorming steps to overcome personality disorder
				06

			Total Duration in Hours	**15**

Unit 3: Information and Communication Technology Skills – IV				
Sn	**Learning Outcome**	**Theory (06 Hours)**	**Practical (14 Hours)**	**20**
1.	Identify the components of a spreadsheet application	• Getting started with spreadsheet – types of a spreadsheet, components of a worksheet, • Starting LibreOffice Calc • Creating a worksheet	• Group activity on identifying components of spreadsheet in LibreOffice Calc	02
2.	Perform basic operations in a spreadsheet	• Opening workbook and entering data – types of data, steps to enter data, editing and deleting data in a cell • Selecting multiple cells • Saving the spreadsheet in various formats • Closing the spreadsheet • Opening the spreadsheet. • Printing the spreadsheet.	• Group activity on working with data on LibreOffice Calc	03
3.	Demonstrate the knowledge of	• Using a spreadsheet for addition – adding value	• Group activity on formatting a spreadsheet in LibreOffice	02

	working with data and formatting text	directly, adding by using cell address, using a mouse to select values in a formula, using sum function, copying and moving formula • Need to format cell and content • Changing text style and font size • Align text in a cell • Highlight text	Calc • Group activity on performing basic calculations in LibreOffice Calc.	
4.	Demonstrate the knowledge of using advanced features in spreadsheet	• Sorting data, • Filtering data, • Protecting spreadsheet with password	• Group activity on sorting data in LibreOffice Calc	03
5.	Make use of the software used for making slide presentations	• Available presentation software • Stapes to start LibreOffice Impress • Adding text to a presentation	• Group practice on working with LibreOffice Impress tools, • Group practice on creating a presentation in LibreOffice Impress	02
6.	Demonstrate the knowledge to open, close and save slide presentations	• Open, Close, Save and Print a slide presentation	• Group activity on saving, closing and opening a presentation in LibreOffice Impress	01
7.	Demonstrate the operations related to slides and texts in the presentation	• Working with slides and text in a presentation- adding slides to a presentation, deleting slides, adding and formatting text, highlighting text, aligning text, changing text colour	• Group practice on working with font styles and types in LibreOffice Impress	04
8.	Demonstrate the use of advanced features in a presentation	• Advanced features used in a presentation, • Inserting shapes in the presentation, • Inserting clipart and images in a presentation, • Changing slide layout	• Group activity on changing slide layout on LibreOffice Impress	03
			Total Duration in Hours	**20**

Unit 4: Entrepreneurial Skills – IV				
Sn	**Learning Outcome**	**Theory (08 Hours)**	**Practical (12 Hours)**	**20**
1.	Describe the concept of entrepreneurship	• Entrepreneurship and entrepreneur • Characteristics of	• Group discussion on the topic "An entrepreneur is not born but created".	08

	and the types and roles and functions entrepreneur	entrepreneurship • Entrepreneurship-art and science • Qualities of a successful entrepreneur • Types of entrepreneurs • Roles and functions of an entrepreneur • What motivates an entrepreneur • Identifying opportunities and risk-taking • Startups	• Conducting a classroom quiz on various aspects of entrepreneurship. • Chart preparation on types of entrepreneurs • Brainstorming activity on What motivates an entrepreneur	
2.	Identify the barriers to entrepreneurship	• Barriers to entrepreneurship, • Environmental barriers, • No or faulty business plan, • Personal barriers	• Group discussion about "What we fear about entrepreneurship" • Activity on taking an interview of an entrepreneur.	04
3.	Identify the attitude that make entrepreneur successful	• Entrepreneurial attitude	• Group activity on identifying entrepreneurial attitude.	04
4.	Demonstrate the knowledge of entrepreneurial attitude and competencies	• Entrepreneurial competencies • Decisiveness, • Initiative • Interpersonal skills-positive attitude, stress management • Perseverance • Organisational skills- time management, goal setting, efficiency, managing quality.	• Playing games, such as "Who am I". • Brainstorming a business ideas • Group practice on "Best out of Waste" • Group discussion on the topic of "Let's grow together" • Group activity on listing stress and methods to deal with it like Yoga, deep breathing exercise.	04
			Total Duration in Hours	**20**

Unit 5: Green Skills – IV				
Sn	**Learning Outcome**	**Theory (05 Hours)**	**Practical (10 Hours)**	**15**

1.	Identify the benefits of the green jobs	• Green jobs
		• Benefits of green jobs
		• Green jobs in different sectors:
		  • Agriculture
		  • Transportation
		  • Water conservation
		  • Solar and wind energy
		  • Eco-tourism
		  • Building and construction
			• Group discussion on the importance of green job,
			• Chart preparation on green jobs in different sectors.
				08

		• Solid waste management • Appropriate technology		
2	State the importance of green jobs	• Importance of green jobs in - Limiting greenhouse gas emissions, - Minimizing waste and pollution, - Protecting and restoring ecosystems, - Adapting to the effects of climate change	• Preparing posters on green jobs, • Group activity on tree plantation. • Brainstorming different ways of mininmising waste and pollution	07
			Total Duration in Hours	**15**

GRADE XII, Part B: Vocational Skills

Sn	Units	Duration in Hours
Unit 1	Setup and Configuration of IoT Devices	60
Unit 2	Level 1 Troubleshooting of IoT devices	60
Unit 3	Organisation Process Standards and Project Management	30
	Total Duration	**150**

Unit 1: Setup and Configuration of IoT Devices				
Sn	**Learning Outcome**	**Theory (30 Hours)**	**Practical (30 Hours)**	**60**
1.	Install and connect Arduino board and Arduino IDE software in computer	• Installation and connection of Raspberry Pi Board to computer, • Installation and connection of Arduino Board to computer, • Checking connectivity • Installation of Arduino IDE software in computer.	• Demonstrate to connect Arduino Board to computer for interfacing, • Demonstrate to connect Raspberry Pi Board to computer for interfacing, • Test Ethernet Connectivity in Arduino uno board, • Demonstrate to install the latest version of Arduino IDE software in computer.	15
2.	Describe the Arduino programming	• Structure and procedure to write and execute program in Arduino IDE, • Libraries, • Arduino software tools, • Workflow in Arduino IDE, • Steps for simulation in Arduino.	• Observe the structure and procedure to write and execute program in Arduino IDE, • Write, complile and execute a program in Arduino IDE for blinking LED, • Write, complile and execute a program in Arduino IDE that connects Arduino board with IR sensor and observe the output	15

			on LED connected to board, • Demonstrate to set up Arduino IDE for the ESP 8266 Node mcu board.	
3.	Initialize and configure Nodes, Gateways, and Control Edge Appliances	• Setting up the basic camera hardware, • Power Supply and cable connection, • Setting up the Internet connection to camera device, • Installation of edge devices, • Testing of network connectivity, • Execution of software.	• Demonstrate to establish the connection between an NVR, device, a camera, and a router. • Demonstrate to initialize a gateway or router, • Demonstrate to connect the physical device to the gateway and test the connectivity.	15
4.	Establish the communication and connnectivity	• Types of USB data transfer, • Data transfer modes – Simplex, Half duplex and Full duplex mode, • Controlling the data transfer, • Data transfer using indicators, • Comparison of data transfer techniques over various networks, • Causes of failure of data transfer, • Remote network connection, • Short-range wireless network connections	• Demonstrate to access the network decive remotely, • Demonstrate to establish the Bluetooth connection with computer using the USB Bluetooth device on Raspbian operating system, • Demonstrate to troubleshoot common data transfer issues.	08
5.	Describe the authentication and authorization mechanism in IoT	• Password based authentication for edge devices, • Token-based authentication, • Biometric authentication, • Multi-factor authentication • Security challenges in authentication • Installation of access control system • Access control system architecture for IoT distributed and centralized architecture, • Control access using security, • Securing wireless connection, • Malware and DDoS attacks, • Checking for malware and DDoS attacks.	• Demonstrate the working of Biometric authentication device.	07
			Total Duration in Hours	**60**

Unit 1: Level 1 Troubleshooting of IoT devices				
Sn	**Learning Outcome**	**Theory (30 Hours)**	**Practical (30 Hours)**	**60**
1.	Check and test connectivity between devices	• Connectivity of IoT devices • IoT test approches & challenges, • IoT Testing Tools – software and hardware, • Testing PIN configuration, • Levels of IoT, • Testing of IoT Systems – Usability testing, Compatibility testing, Regulatory testing, Security and privacy testing, Upgrade testing, • Performance and real-time testing, End-user application testing, Connectivity testing, Functional testing, • Setting up components for IoT testing, • Preparing the device, • Setting up the server, • Enabling the connections, • IoT testing – Manual testing, Automatic testing, • Testing of IoT devices – Sensors, Actuators, • Verifying network connectivity, Event viewer, • Hardware components, • Requirements for IoT connectivity, • Importance of choosing the right connectivity technology, • Connecting the IoT – Trade-off between power consumption, Range, and Bandwidth, • Testing of connectivity modules, • End to end testing of IoT network.	• List the types of testing required in IoT, • List the IoT test approaches, • List the IoT testing tools, • Illustrate to test pin configuration, • Demonstrate to test proximity sensor using a multimeter, • Demonstrate to test temperature sensor TMP36 using a multimeter, • Demonstrate to test a servo motor connected with an Arduino board using a push button switch, • Demonstrate to verify local network connectivity and identify configuration issues, • Demonstrate to check the connectivity of ESP8266 Node MCU to an LCD display unit.	30
2.	Test storage, power supply and internet connectivity of IoT boards	• Testing on-board memory storage, • Testing the storage in Arduino board and Raspberry pi board, • Testing the on-board power supply in Arduino board and Raspberry pi board	• Illustrate the steps to check the available storage space on on-board memory storage card for storing node data in Raspberry Pi under various hardware.	15

3.	Check Communication between Devices	• Test for Node and Gateway Software • Testing communication between devices, • Testing of Node and Gateway software, • Checking communication link performance matrix, • Data transfer from gateway to server, • Checking connectivity, • Setting connectivity credentials	• Identify the steps for loading software and testing the communication between devices • Demonstrate to check MTU value, • Demonstrate to check the data loss in the network, • Demonstrate to test the delay in the Network, • Find the port 18211 and 127 using netstat command in windows and Linux	15
			Total Duration in Hours	**60**

Unit 3: Organisation Process Standards and Project Management				
Sn	**Learning Outcome**	**Theory (12 Hours)**	**Practical (18 Hours)**	**30**
1.	Describe Organisational Processes and Standards	• Organisational processes and its importance, • Elements of organisational process – Unity, Teamwork, Delegation of Work, • Steps of Organisational Process – Analyse the target, create the strategy, categorise the work, assign and give authorization, coordinate and maintain relationships, • Common organisational structure,	• Identify the elements and steps of an organisational process, • Identify the hierarchy in an organisation, • Arrange the various personnel in an ascending order as per their position in an organisation, • Demonstrate the organizational process steps to IoT device installation and configuration.	10
2.	Describe the project Management concepts and applications	• Concept of project, • Project Management – Project Initiation, Project Planning, Project Execution, Project Monitoring and Controlling, Project Closing • Project Handling, • Examples of IoT based Projects, • Project on Humidity and Temperature Sensing Device using IoT, Project on Air Pollution Measuring Device Using IoT	• List the steps of IoT project implementation process, • Demonstrate to implement a project to control the LEDs over the Internet using IoT applications.	10
3.	Maintain Records and process Documents	• Business Records, • Methods to Store Records, • Importance of Storing Records,	• Identify business records, • List the methods of record maintenance,	10

		• Recording Performance, • IoT Services, • Importance of documentation, • Document Format, • Global format system used for documentation, • Document Processing • Role of Telecom Technician for Record Maintenance.	• List the steps of document processing, • List the tools used in document processing, • List the qualities required to do documentation, • Create a sample of documentation format for IoT device installation.	
			Total Duration in Hours	**30**

6. ORGANISATION OF FIELD VISITS and OJT

In a year, at least 3 field visits/educational tours and On-the-Job-Training (OJT) in vacation should be organised for the students to expose them to the activities in the workplace. Visit a service centre of Telecom industry and observe the it sLocation, Site, home appliances, tneir installation, repair and maintenance. Students should achive the following outcomes.

1. Collate installation points for capturing desired input parameters and gateway accounting to meet power supply requirements.
2. Connect the communication line using appropriate nodes, gateway, ethernet, and 3G/4G/Wi-fi networks and check the functioning of the protocols.
3. Record appropriate technical forms, activity logs.
4. Demonstrate how to locate points on surface and mount IoT devices at identified points/location.
5. Supervise necessary connections for power supply and earthing.
6. Ensure that the cable connectors and microcontroller used for data transfer device,
7. Install suitable framework on desktop/laptop.
8. Compile on-board microprocessor code using appropriate framework.
9. Supervise the team to ensure proper functioning of microcontroller and related devices.
10. Set up nodes and gateways appropriately for execution of the uploaded software.
11. Determine that effective connectivity is maintained between gateway and local Wi-fi router or 3G/4G connectivity options.
12. Verify data transfer and confirm the same from the server end.
13. Connect devices, cables, connectors, grounding, frameworks and perform their error reading & troubleshooting.
14. Set up a test environment and formulate test strategy/test cases.
15. Verify all connections and pin/jumper settings are uninterrupted.
16. Perform re-loading of node software.
17. Create appropriate connectivity IDs/password in the software code.
18. Check and test communication link performance matrix between node and gateway.
19. Test data transfer from gateway to server.
20. Report issues/concern to the central/main tech team.

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.

Classroom Aids

Whiteboard and Markers, Chart paper and sketch pens, LCD Projector and Laptop for presentations

Tools and Equipment

Raspbian, RasW, SODAQ, Tessel, Pinoccio, OpenPicus, Microduino, LightBlue Bean Punch Through, Flutter, Beagle Board, Arduino Yún, Node-RED, M2MLabs Mainspring, Kinoma, Arduino, Eclipse, IoT Project, Freeboard, Spark, Service Manual/ User Manuals, Program Authentication Form, Customer Feedback form

Personal Protection Equipment: Safety glasses, Head protection, Rubber gloves, Safety footwear, Warning signs and tapes, Fire extinguisher and First aid kit

8. TEACHER'S/TRAINER'S QUALIFICATION

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

Qualification	Minimum Competencies	Age Limit
Bachelor's degree in appropriate branch of Engineering/ Technology. ***Desirable:*** Knowledge and skills of installation of IoT devices.	The candidate should have minimum 1 year of work experience. Good communication skills in English and local language.	18-37 years (as on Jan. 01 (year)) Age relaxation to be provided as per Govt. rules

Note – The qualifications for vocational teachers mentioned above is suggestive and not prescriptive. The States/ UTs can make modifications in the qualifications for appointment of vocational teachers/ trainers as per their requirement through a committe appointed by the competent authority in the State/ UT Directorate/ Department of School Education.

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

The curriculum was developed by the,

Member Coordinator

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