LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE:
Telecom Technician – IoT Device/ Systems

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

SECTOR: Telecom

Grades XI and XII

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

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

CONTENTS

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 Device and System	60	**40**
Unit 2	Installation and Configuration of IoT Devices	90	
	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	Level 1 Troubleshooting of IOT devices	90	**40**
Unit 2	Work & Resources Organisation and Occupational Health & Safety	30	
	Total Hours	**120**	**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 Device and System	60
Unit 2	Installation and Configuration of IoT Devices	90
	Total Duration	**150**

Unit 1: IoT Device and System				
Sn	**Learning Outcome**	**Theory (20 Hours)**	**Practical (40 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, • Role and responsibilities of Telecom Technician – IoT Devices and Systems, • Organisational policies on workplace ethics, • Managing sites, quality standards, personnel management and public relations.	• 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 Technician – IoT Devices and Systems.	08
2.	Identify the scope and future of industry of IoT devices and system	• Process workflow in the organization and the role of Telecom Technician – IoT Devices and Systems, • Scope of work for an Telecom Technician – IoT Devices and Systems	• List the various daily, weekly, monthly operations/activities that take place at the site under Telecom Technician – IoT Devices and Systems, • Prepare the chart showing the scope of work for Telecom Technician – IoT Devices and Systems.	07
3.	Describe the Basics of Micro-processor Boards and Microcontroller Units	• Introduction to Internet of Things, • Applications of Internet of Things, • Introduction to Microprocessor and Microcontroller, • Getting Acquainted with Various Boards, • Microprocessor Boards – Arduino, Raspberry Pi, Customized Single Board Platform • Framework for Internet of Things for Assistance Services	• Draw the diagram of Internet of Things, • List the applications of Internet of Things, • Identify the various Microprocessor Boards • Illustrate the Framework for Internet of Things for Roadside Assistance Services	08

4.	Describe the Functioning of Sensors and Actuators	• Sensors and their Usage, • Different Types of Sensors – Temperature Sensors, Proximity Sensors, Pressure Sensors, Accelerometer Sensors, Humidity Sensors, Touch Sensors, Reed Sensor, Analog Sensors, Digital Sensors, • Actuators, • Examples of Actuators, • Workinf of Sensors with Actuators, • Importance of Accurate Sensors, • Programming a Microcontroller Board.	• List the various types of sensors, • Illustrate to use and connect different types of sensors, • Illustrate the application of the various types of sensors, • Illustrate the differentiation in the various types of sensors, • Identify the importance of actuators.	08
5.	Describe the Application of Communication Protocols in Internet of Things	• Short-range Communications Systems and their Typical Operating Ranges, • Various Types of Short- range Communications, • Short-range Communication Architecture, • Data Transfer Types and Protocols in Internet of Things, • Multiprotocol Readers and Sensors in Internet of Things	• List various short-range wireless communications systems, • Identify the protocols used for communication in IoT, • Compare different communication technologies • Write the data rates and bands available for the technologies given in the table	07
6.	Describe the Micro-controller Boards, PIN Configurations and their Interconnectivity	• Microcontroller, • Components of Microcontroller, • PIN Configurations of various Microcontroller boards, • Interconnectivity of Pins of Microcontroller boards, • Comparison of various parameters of various microcontroller board.	• Identify the various parts of Microcontroller, • Identify the pins in various Microcontroller boards, • Label all the parts of the Raspberry Pi board, • Label all the parts of the Arduino board,	07
7.	Describe the Edge Devices	• Introduction to Edge Devices, • Function of Edge Devices, • Types of Edge Devices – Sensors and Actuators, • Examples of Sensors and Actuators.	• Identify the different types of edge devices, • Identify the different types of Sensors and Actuators,	05
8.	Describe the Nodes and Gateways	• Nodes and Gateways in Internet of Things, • IoT Edge Device/Node, • Basic Steps in Setting up an IoT	• List the steps in setting up an IoT framework, • List the components that can be included in IoT edge.	05

		Framework, • Functions of edge devices.	• List the functions of edge devices.	
9.	Describe the Cloud Computing	• Concept of Cloud Computing, • Characteristics of Cloud Computing, • Deployment Models, • Cloud Optimization and Business Analytics, • Advantages of Cloud in Internet of Things, • Networking Essentials, • User Datagram Protocol, • Secured Socket Layer	• Demonstrate to perform the prototyping of Raspberry Pi kit,	05
			Total Duration in Hours	**60**

Unit 2: Installation and Configuration of IoT Devices				
Sn	**Learning Outcome**	**Theory (40 Hours)**	**Practical (50 Hours)**	**90**
1.	Establish the Framework for Internet of Things	• Installing the IoT Framework, • Collating Installation Points and Collecting Data, • Input Parameters Captured by Sensors, • Calibrating User Data	• List the steps of installation of IoT framework, • Demonstrate to collect data, • List the input parameters for a sensor device	04
2.	Install Gateway as per the Power Supply Requirements	• Power Supply of the Edge Nodes and Gateways, • Setting up the Installation Points, • Steps to install and test the Gateway, • Install the Nodes, • Installing Plug-In Nodes, • Installing Wired (DC) Nodes, • Connecting Devices Using Wired Ethernet and Using Wi-Fi, • Test the Installation	• Identify the location to perform installation of a motion sensor and CCTV camera at a site, • Perform configuration of motion sensors with the network provided on the site, • Perform a power, Ethernet and other types of cable connections to a gateway on a site, • Perform connection of a sensor (nodes) and a router to through wired and unwired manner	05
3.	Establish Communication between Nodes, Gateway and Servers	• Communication Channel, • Physical Transmission Media, • Wireless Transmission Media, • IoT Cloud Framework, • Examples of IoT Cloud Framework, • Sensor Gateway and Channels, • Components of sensor node,	• Identify and name the various Physical Transmission Media, • List the distingushing features of Physical Transmission Media, • List the distingushing features of Wireless Transmission Media, • Identify and list the various IoT Cloud Framework, • Draw a digram illustrating the	05

		• Sensor Connectivity,	stages of IoT data management in cloud platform, • Draw a diagram showing the structure of a sensor node, • Draw the sensor connectivity diagram	
4.	Establish Ethernet Connectivity	• Ethernet Connectivity Options – waired amd wireless, • Characteristics of Ethernet • Types of Ethernet and standards, • Connecting IoT Devices to the Network using Wired Ethernet, • Connecting devices using Wi-Fi, • Network configurtion settings, • Challenges of Ethernet Connectivity	• Demonstrate to connec IoT devices to the network, • Demonstrate to prepare Ethernet cable and connector, • Demonstrate to connect and configure IoT devices to the network using wired network and wireless network, • Demonstrate to configure Ethernet connection on a Laptop/computer system, • Connect Raspberry pi to another device through wired Ethernet,	05
5.	Demonstrate authentication and authorization in IoT	• Importance of authentication and authorization in iot, • Security check list for edge devices in iot, • Security challenges in authentication, • Authentication of edge devices, • Access control, • Access control system architecture, • Steps of installing an access control system, • Third party software for access control, • Control access using security, • Securing wireless connection, • Malware and distributed denial of service (ddos) attacks	• Identify the software interface characteristics, • List different software available for access control management, • List the steps of installing an access control system • Illustrate the third oarty software for access control, • Illustrate to set up the software interface for access control, • Demonstrate to secure wireless connection, • Demonstrate to remove malware and distributed denial of service (DDoS) attacks, • Install a BMP280 temperature and pressure sensor on an Arduino, • Check the power supply connectivity to installed IoT camera.	06
6.	Undertake pre-installation preparation of IoT devices	• Preinstallation requirement analysis and site requirements of IoT devices, • Creating of site log,	• Create the site log for installation of IoT device, • Observe general safety instructions for installation of IoT	05

		• Location for Installing the device, • Installation checklist, • General safety instructions for installation of IoT devices, • Location for Installing the device	devices, • List the factors to choose the location for installing the IoT device, • Prepare Installation Checklist,	
7.	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	• Identify the 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.	06
8.	Mount the devices at desired locations	• Surface preparation mounting devices, • 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	• Prepare the surface for mounting devices, • 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 an IoT framework, • Draw a diagram of wiring set up for a camera in IoT, • Make cabling and power connections • Mount a security camera system and connect it to the monitor and the DVR	06
9.	Perform checks and connections of devices	• Connectivity between the devices, • Steps to check the connectivity between devices, • Preparation of devices for transmission of data,	• Checking the connectivity between devices, • Illustrate the preparation of devices for transmission of data, • Perform grounding of an electrical connection,	05

		• Power supply and grounding, • Post commissioning tests, • Mode of communication between the devices, • Connectivity between devices.	• Create a checklist for the tests performed in testing an IoT setup, • Test the speed of 3 Wire Speed Sensors using a multimeter, • Perform mounting of a sensor device on a wall.	
10.	Connect Microcontroller Boards for Data Transfer and Connecting the Boards	• Connectivity Points in Microcontrollers, • Common microcontroller boards – Arduino, Raspberry Pi, • Various parts of Arduino and Raspberry pi boards, • Pin configuration of an Arduino board • Optimization of the Micro controller, • Connecting IP enabled and Non-IP enabled devices	• Identify and name the various parts of Arduino and Raspberry pi boards, • Identify the connectivity points in Arduino and Raspberry pi, • List the connectivity options available for microcontroller, • List the types of cables and connectors, • Demonstrate to connect a device to the microcontroller board, • Demonstrate the steps to connect IP enabled and Non-IP enabled devices	05
11.	Types of Cables and Connectors	• Various types of connectors used for connecting communication cables, • Various types of network cables used for connecting communication cables,	• Indentify and name various types of connectors used for connecting communication cables, • Identify and name the various types of network cables used for connecting communication cables,	05
12.	Installing Suitable Framework	• Procedure of connecting Arduino microcontroller to PC, • Procedure of connecting Raspberry Pi microcontroller to PC,	• Identify and name the cables that are attached to the Raspberry Pi board, • Execute the steps of connecting Arduino and Raspberry Pi microcontroller board to PC.	05
13.	Transfer software code to on-board Microprocessor and Compile code to on-board Microprocessor	• Nodes and Gateways, • Understanding the code, • Structure of a program in Arduino, • Commands of Arduino programming, • Transferring software code through Wi-Fi module, Bluetooth module, SD card, ZigBee modules and so on,	• Identify the nodes and gateways in IoT network, • Illustrate the basic coding structure of microcontroller, • Identify the options to transfer codes, • Illustrate the steps to load the software code from the nodes to microcontroller board, • List the types of compilers	06

		• Steps to load a software code from the nodes to the microcontroller board, • Challenges in transfer of code, • Types of compilers, • Compiling a code, •	available for microcontroller programming, • Explain how to compile a code, • Writing the commands in Arduino boards programming, compile and execute the code.	
14.	Identify Error Codes and Debug Software	• Various ways of debugging a microcontroller, • Setting Debugging Mode in Microcontroller, • Common errors in Arduino, • Error codes and its interpretation	• Identify the ways of debugging a microcontroller code, • Demonstrate the steps of setting the software in debug mode, • Write the interpretation for the given code and message used for debugging a microcontroller.	05
15.	Check functioning of microcontroller and attached devices	• The Basic Framework, • Steps to check the microcontroller functions, • Checking connectivity, • Using Emulator to check functioning of devices, • Managing the communication hurdles	• Install and run a program on an Arduino board, • Install and run a program on a Raspberry Pi board, • Install an Arduino Uno software on a windows OS and configure for a fingerprint sensor, • Perform a connectivity check on an Arduino board, • Debug a Raspberry Pi board microcontroller	05
16.	Initialize Nodes and Gateways	• Prerequisites for initialization of nodes and gateways, • IoT Device Installation, • Set up the basic hardware, • Cable and Power Supply connection, • Set up the Internet connection of camera device, • Configuration of edge appliances, • Node Initialization, • Gateway Initialization, • Connectivity checks, • Software execution scenarios, • Launching the Software on Nodes and Gateways.	• Illustrate the steps to connect a physical device to the gateway and to test the network connectivity, • Illustrate to setup basic hardware, cable and power supply, • Illustrate to set up internet connection to camera device, • Demonstrate the steps of node and gateway initialization, • Identify the prerequisites for software installation.	06
17.	Confirm Communication and Establish Connectivity	• Data Transfer Using the Indicators, • Data Transfer Comparison Scenarios, • Data Transfer Failure Scenarios,	• Lists the different indicators on a device, • Illustrate the comparison between the data transfer over various networks,	06

		• External Connectivity, • Steps to connecting to the network remotely, • Connecting to different short range wireless networks, • Connecting to Bluetooth network, • Connecting to ZigBee network	• List the different data transfer failure scenarios, • Prepare a comparative table for the different types of communication channels used in IoT. • Illustrate the steps to connect to a network remotely by different communication technology, • Write down the steps involved in connecting a Bluetooth using a Raspberry Pi framework.	
18.	Control Edge appliances and Hubs	• Configuring a Router, • Controlling devices by connecting to a Hub, • Bypassing the Hub, • Configuring the Bridge Mode to Bypass the Hub	• Illustrate the steps in configuring a Bridge Mode to bypass a hub, • Illustrate the steps involved in configuring a router, • Configure a router to connect a sensor device remotely to the network, • Perform a Raspberry Pi board Bluetooth network configuration.	05
19.	Check and confirm data transfer from the server end	• Types of Data Transfer, • Data Transfer Mode, • Controlling the Data Transfer	• Perform the steps to control the data transfer rate of a router,	03
			Total Duration in Hours	**90**

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	• Active listening -listening skill, stages of active listening,	• Group discussion on the factors affecting active listening,	07

	skills	• Overcoming barriers to active listening	• Preparing posters of steps for active listening, • Role-play on negative effects of not listening actively	
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
			• Group discussion on self awareness
			• Group discussion on common personality disorders
			• Brainstorming steps to overcome personality disorder
				06

		• Anxious • Steps to overcome personality disorders		
			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 working with data and formatting text	• Using a spreadsheet for addition – adding value 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	• Group activity on formatting a spreadsheet in LibreOffice Calc • Group activity on performing basic calculations in LibreOffice Calc.	02
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 and the types and roles and functions entrepreneur	• Entrepreneurship and entrepreneur • Characteristics of 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	• Group discussion on the topic "An entrepreneur is not born but created". • Conducting a classroom quiz on various aspects of entrepreneurship. • Chart preparation on types of entrepreneurs • Brainstorming activity on What motivates an entrepreneur	08
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	• Entrepreneurial attitude	• Group activity on identifying entrepreneurial attitude.	04

	entrepreneur successful			
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
		  • Solid waste management
		  • Appropriate technology
			• Group discussion on the importance of green job,
			• Chart preparation on green jobs in different sectors.
				08

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	Level 1 Troubleshooting of IOT devices	120
Unit 2	Work & Resources Organisation and Occupational Health & Safety	30
	Total Duration	**150**

Unit 1: Level 1 Troubleshooting of IoT devices

Sn	Learning Outcome	Theory (20 Hours)	Practical (40 Hours)	60
1.	Test connectivity between devices	• Connectivity of IoT devices • Types of IoT testing, • IoT test challenges • IoT Testing Tools – software and hardware, • Testing PIN configuration,	• List the types of testing required in IoT, • List the IoT test approaches, • List the and IoT testing tools • Illustrate to test pin configuration	05
2.	Check connectivity between devices	• Node Gateway Connectivity – Via IoT Gateways, Directly – IoT Nodes, • Network Connectivity, • Local Connectivity,	• Illustrate the steps to configure IP details, • Illustrate the steps to test TCP/IP connectivity by using the ping command	05
3.	Checking On-board Memory Storage Card	• Checking the Storage, • Local Storage Options for the Arduino	• Illustrate the steps to check on-board memory storage card for storing node data in Raspberry Pi,	04
4.	Test the working of connectivity modules	• Checking the Network for Range, Bandwidth, Intermittent connectivity, Security, • Factors to be considered for testing the bandwidth of an IoT network	• List the parameters to check working of on-board Wi-Fi or 4G/5G connectivity module, • Write the steps involved in testing the packet loss in network, • List the steps to run Wireshark	05
5.	Check the On-board Power Supply	• Checking of on-board power supply, • Different types of hardware considerations for IoT hardware power testing	• Demonstrate to check power supply at different hardware configurations	04
6.	Check the Communication Link Performance Matrix	• Performance Matrix Parameter – MTU, Data loss, Delay, • Role of Maximum transmission unit (MTU), data loss, delay and reliability	• Perform the steps to check the best value of maximum transfer unit for an internet connection, • Illustrate the steps to check data loss in network, • Run and capture data loss by	04

			using Wireshark in a network, • Perform test delay in a network.	
7.	Check data transfer from Gateway to Server	• Basic troubleshooting steps to check the data transfer between the gateway and the server, • Checking Connectivity,	• Identify the basic troubleshooting steps to check the data transfer between the gateway and the server	04
8.	Check Communication between Devices	• Test for Node and Gateway Software	• Identify the steps for loading software and testing the communication between devices	04
9.	Set Connectivity Credentials	• Securing Devices	• Check the on-board memory storage card for storing node data in Raspberry Pi.	02
10.	Prepare IoT project for humidity and temperature sensing device	• Set up objecive of the project, • Specify the requirement of project, • Block diagram of the setup, • Circuit diagram, • Basic working, • Construction of project	• Write the objecive of the project, • List the requirement of project, • Draw the block diagram of the setup, • Draw the Circuit diagram, • Demonstrate the basic working and construction of project	06
11.	Prepare an IoT project for air pollution measuring device	• Set up objecive of the project, • Specify the requirement of project, • Block diagram of the setup, • Circuit diagram, • Basic working, • Construction of project	• Write the objecive of the project, • List the requirement of project, • Draw the block diagram of the setup, • Draw the Circuit diagram, • Demonstrate the basic working and construction of project	06
12.	Describe Organisational Processes and Standards	• Organisational processes, • Importance of organisational processes, • Elements of Process, • Steps of Organisational Process, • 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	05
13.	Describe the	• Concept of project,	• List the steps of an IoT project	

	project handling concepts and applications	• Project Handling, • Project Implementation Process,	implementation process	
14.	Maintain Records and process Documents	• Business Records, • Methods to Store Records, • Importance of Storing Records, • Recording Performance, • IoT Services, • Methods to Record Performance, • Importance of documentation, • Document Format, • Global format system used for documentation, • Document Processing • Qualities for Record Maintenance,	• Identify business records, • List the methods of record maintenance, • List the steps of document processing, • List the tools used in document processing, • List the qualities required to do documentation	06
			Total Duration in Hours	**60**

Unit 2: Work & Resources Organisation and Occupational Health & Safety				
Sn	**Learning Outcome**	**Theory (12 Hours)**	**Practical (18 Hours)**	**30**
1.	Maintain the self and workplace health and hygine to achieve optimum productivity	• Recent trends in telecom industry, • Common problems in telecom industry, • Organisation structure of telecom industry, • Policies, procedures, standards and work ethics in telecom industry, • Duties and responsibilities of various personnels in telecom industry • Importance of basic hygine practices, cleanliness, safety and tidy workplace, • Organisational hygiene and sanitation guidelines and procedure to report breaches and gaps, • Different methods of cleaning, disinfection, sanitization • Importance of time management and quality to meet daily target,	• List the receent trends in telecom industry, • List the common problems in telecom industry, • Draw a chart showing orgnisation structure of telecom industry with different positions, • Enlist the duties and responsibilities of various personnels 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, 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	10

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, • Stetch 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 segregate recyclable/non-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**

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:

Minimum Educational Qualification	**Specialization**	**Age Limit**	**Industry Experience**		**Training Experience**	
			Years	***Specialization***	***Years***	***Specialization***
Bachelor Degree in appropriate branch of Engineering (Electronics/ Telecom) **OR** SSC Certified on the said job role "Telecom Technician IoT Devices/System" (TEL/Q6210) with Minimum accepted score is 80%	IoT Devices/ Optical Fiber/ Broadband Domain Good communication skills in English and regional language, Practical skilled to handle and operate tools and equipment with safety	18-37 years (as on January 1 of current year) Age relaxation to be provided as per Govt. rules	1 Year	IoT Devices/ Optical Fiber/ Broadband Domain	1 Year	Electronics/ Telecom

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,

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