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सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
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National
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Telecom
Sector
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Council

Facilitator Guide

Sector
Telecom

Sub-Sector
Network Managed Services

Occupation
Network Operation & Maintenance

Reference ID: TEL/Q6207, Version 2.0
NSQF Level: 4

Grass Root Telecom Provider

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Telecom Sector Skill Council of India

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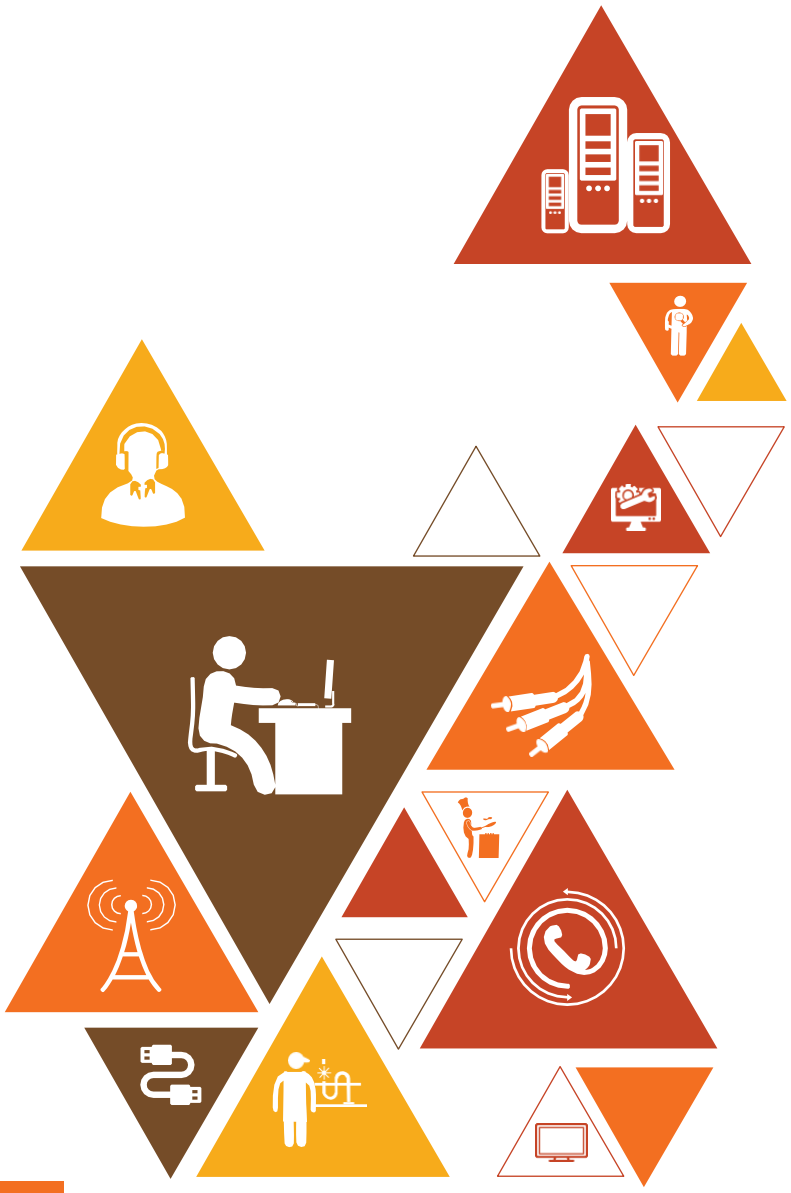
> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India



Acknowledgements

The Telecom Sector Skill Council (TSSC) would like to thank to all the individuals and institutions who contributed in various ways towards the preparation of this “Facilitator Guide”. The guide could not have been completed without their active contribution. Special gratitude is extended to those who collaborated during the development of the different modules in the facilitator guide. Wholehearted appreciation is also extended to all who provided peer review for these modules.

The preparation of this guide would not have been possible without the Telecom Industry's support. Industry feedback has been extremely beneficial since inception to conclusion, and it is with the industry’s guidance that we have tried to bridge the skill gaps existing today in the Industry.This facilitator guide is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavors.

About this Guide

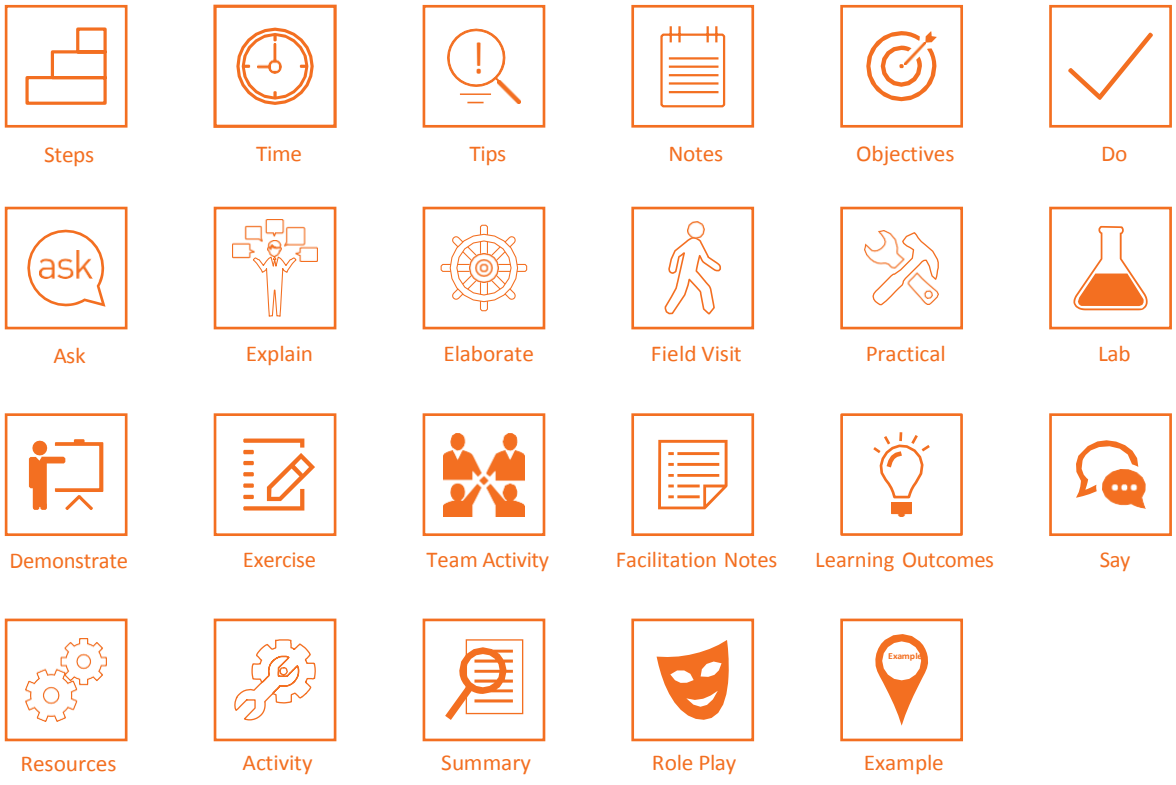
The facilitator guide (FG) for Grass Root Telecom Provider is primarily designed to facilitate skill development and training of people, who want to become professional Grass Root Telecom Provider in various organizations. The facilitator guide is aligned to the Qualification Pack (QP) and the National Occupational Standards (NOS) as drafted by the Sector Skill Council (TSSC) and ratified by National Skill Development Corporation (NSDC).

It includes the following National Occupational Standards (NOSs)-

1. TEL/N6226 – Maintain Site Hygiene and Implement Security
2. TEL/N6227 – Perform Preventive Maintenance
3. TEL/N6228 – Promote Usage of Telecom Devices and Provide services
4. TEL/N9101 – Organize work and resources as per health and safety standards
5. TEL/N9102 – Interact Effectively with Team Members and Customers
6. DGT/VSQ/N0101 - Employability Skills (30 Hours)

Post this training, the participants will be able to perform tasks as professional Distributor Sales Representatives. We hope that this Facilitator Guide provides a sound learning support to our young friends to build a lucrative career in the Telecom Skill Sector of our country.

Symbols Used



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1. Roles and Responsibilities of a Grass Root Telecom Provider

Unit 1.1 – Introduction to Communications
Unit 1.2 – Industry Outlook Global & National
Unit 1.3 – Role and Responsibilities of Grass Root Telecom Provider and scope of GRTP
Unit 1.4 – Electro Magnetic Spectrum
Unit 1.5 – Introduction to Mobile Technology
Unit 1.6 – Introduction to Optical Communication System

Key Learning Outcomes

At the end of this unit, you will be able to understand:

1. Know the History of Telecom
2. Types of Communication Systems
3. Various Transmission Media
4. Telecom Growth in India
5. Learn Key aspects of Electro Magnetic Spectrum
6. Features of Electro Magnetic Wave
7. Learn about key Regions of Electro Magnetic Spectrum and their Functions
8. Overview of Mobile Technology
9. Need for Fiber-Optic Communications
10. Optical Communication Systems
11. Optical Fibers as a Communication Channel
12. Optical Transmitters & Receivers

UNIT 1.1 : Introduction to Telecommunications

Unit Objectives

At the end of this unit, you will be able to understand:

1. History of telecom
2. Types of Communication System
3. Various Transmission Media

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

1.1.1 Note

This is the first session of this program. Introduce yourself, explain the program and the purposes of the program in detail. Describe the participants that how the program will help them to get a job. Ensure the participants understand how their entire course duration will be structured and how they will be benefit from the course.

1.1.2 Say

Good morning and warm welcome to this training program on Grass root Telecom Provider. Now let us start the unit by discussing about the history of telecom and the basic components of communication.

1.1.3 Do

Share with the participants about the details of historical mlie-stones of communications, tele-communication basics & its components.

1.1.4 Ask

Ask the participants whether they know telecom evolutions. If yes, ask them to name the evolution and list it on blackboard and complete it with the points given in the participant handbook.

1.1.5 Elaborate

Refer to participant handbook to explain the various telecom evolutions in the history of telecom and refer it to explain the following.

1. Communication system:

Communication is an exchange of Information between 2 parties/person/ nodes. Any communications system aims at best and effective exchange of information. Communication system communicates Voice, SMS, Video, text, Music, live sessions from one point to other. Technically on Network front communication system consists of device which transmits the information, and a device which receives it. Channel is a medium through which the communication takes place. Channel could be wired medium or wireless medium (over AIR).

Types

Simplex system:

Simplex communication is a communication channel that sends information in one direction only. The International Telecommunication Union (ITU) defines the system as communication-channel that operates in one direction at one given time.

Half duplex system:

In Half-duplex system, there are still two clearly defined paths/channels and each party can communicate with the other but not simultaneously; the communication is one direction at a time.

Full duplex system:

A duplex communication system is a point-to-point system composed of two connected parties or devices that can communicate with one another in both directions.

1.1.6 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 1.2: Industry Outlooks: Global & National

Unit Objectives

At the end of this unit, you will be able to understand:

1. Telecom Growth in India

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides

1.2.1 Note

This is the second session of the program which talks about global and national industry outlooks on telecom. Kindly explain about it to participants to enable them to perform their task effectively.

1.2.2 Say

Let us have a quick recap of the previous session.

1.2.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Name the important telecom evolutions in telecom industry
- Name the basic components of Communication
- Name the all transmission channel classifications

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

1.2.4 Say

Now let us begin a new session on Telecom growth in India.

1.2.5 Do

Tell the participants to get ready for an activity on Telecom Growth in India.

1.2.6 Activity

Ask Participants to refer Participant handbook and internet to study in details about the telecom growth in India.

Skill Practice	Time	Resources
• Self-study Internet Browsing	01 Hrs	Writing pad, Internet, Computer, PH

1.2.7 Elaborate

Refer to Participant handbook in order to get a better understanding about the telecom growth in India.

1.2.8 Say

Let us talk about one of the main telecom organization ITU (International Telecom Union).

1.2.9 Do

Share details to the participants on International Telecom Union.

1.2.10 Elaborate

Refer to participant handbook to explain the participants about ITU and its features.

1.2.11 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 1.3: Role and Responsibilities of Grass Root Telecom Provider and Scope of GRTP

Unit Objectives

At the end of this unit, you will be able to understand:

1.1. Describe the roles and responsibilities of a Grass Root Telecom Provider

2.Understand the organizational policies pertinent to GRTP

3.Identify the standard checklists and schedules recommended by OPCOs

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides

1.3.1 Note

This is the session of the program which state the role and responsibilities of Grass Root Telecom Provider and scope of GRTP. . Kindly explain about it to participants to enable them to perform their task effectively.

1.3.2 Say

Let us have a quick recap of the previous session.

1.3.3 Do

Begin with revising the things explained in previous session. Ask the following question

- List the responsibilities of GRTP in telecom industry
- Understand the organizational policies pertinent to GRTP

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

1.3.4 Say

Now let us begin a new session on roles and responsibilities of a Grass Root Telecom Provider and its scope.

1.3.5 Do

Tell the participants to get ready for an activity on understanding role and responsibilities of GRTP.

1.3.6 Activity

- Conduct a group discussion on the skills required for a GRTP
- Ask the participants what they have learnt from this exercise
- Ask if they have any questions and close the discussion by summarizing the responsibilities of GRTP

Skill Practice	Duration	Resources
Group Discussion	01 Hour	Participant handbook, pen, notebook, laptop, overhead projector, microphone (if required), etc.

1.3.7 Elaborate

Refer to Participant handbook in order to get a better understanding about the session.

1.3.8 Do

- Ensure that all the trainees participate in the group discussion • Ensure a friendly atmosphere during the group discussion • Guide the students in identifying key points

1.3.9 Notes for Facilitation

- Encourage peer learning
- Answer all the doubts raised by the trainees in the class
- Discuss the proper communication technique in group discussion

UNIT 1.4: Electro Magnetic Spectrum (EMS)

Unit Objectives

At the end of this unit, you will be able to understand :

1. Electro Magnetic Spectrum

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

1.4.1 Note

This is the third session of the program which talks about Electromagnetic spectrum. Kindly explain the EMS details to participants to enable them to perform their task effectively.

1.4.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

1.4.3 Do

Begin with revising the things explained in previous session. Ask the following questions

- Explain the major milestones of Indian telecom sector
- What are the functionalities of ITU?

Encourage participants to give answers. if they have any doubt, clarify it and Tell them about what they are going to study in new session.

1.4.4 Say

Now let us begin a new session on Electromagnetic Spectrum (EMS).

1.4.5 Ask

Ask participant about the details of EMS. If they are responding properly, collect their ideas and list it on whiteboard.

1.4.6 Do

Share the details of Electromagnetic spectrum, its applications and the features to participants.

1.4.7 Elaborate

Electromagnetic Spectrum: Electromagnetic spectrum is a group of frequency ranges based on the frequency ranges. An electromagnetic wave is transverse, meaning that even as it moves forward, it oscillates in a direction perpendicular to the line of propagation.

Electromagnetic Spectrum Uses / Application

Radio Waves: Used for Broadcasting & communication purpose -their longer wavelength means they travel further in the earth's atmosphere, reflecting off hills and the upper atmosphere.

Microwaves: Used for Cooking food (microwave are absorbed by water molecules causing them to vibrate -heat up) & Satellite transmission (their wavelength penetrates our atmosphere).

Infrared: Used for Heater & night vision equipment - all objects, including people, give out infrared rays which can be detected even at night. It's also used for television remote controls.

Visible Light: Used for Human vision, photography & optical fibers it's fine only part of the spectrum we can see.

Ultraviolet: Used for Florescent lamps - they have chemicals inside them which absorb ultraviolet rays & convert the energy to visible light.

X-Rays: Used for Medical equipment - they enable us to see the internal structure of objects & materials by passing through some substances (Eg: Body tissue) but being observed by others (Eg: Bone).

Gamma Rays: Used for Sterilizing food & medical equipment - they are highly penetrative & can kill cancer cells.

1.4.8 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 1.5: Introduction to Mobile Technology

Unit Objectives

At the end of this unit, you will be able to understand:

1. Overview of Mobile Technology

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

1.5.1 Note

This is the fourth session of the program which talks about mobile technologies. Kindly explain about mobile technologies to the participants to enable them to perform their task effectively.

1.5.2 Say

Good morning and warm welcome to this training program on Grass root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

1.5.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Define EMS (Electromagnetic Spectrum)
- What is the frequency ranges of Electromagnetic Waves?

Encourage participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in new session.

1.5.4 Say

Now let us begin with a new session on Mobile technology.

1.5.5 Ask

Ask following questions to participants to verify their knowledge on mobile technologies.

- Arrange the mobile technologies in the increasing order of Data rate
- Define LTE 4G
- List 4G and 3G mobile operators in your region

1.5.6 Do

Share the details to participants about evolution of Mobile technology.

1.5.7 Elaborate

1G (or 1-G) refers to the first generation of wireless telephone technology (mobile telecommunications). These are the analog telecommunications standards that were introduced in the 1980s and continued until being replaced by 2G digital telecommunications.

2G (or 2-G) second-generation 2G wireless telephone technology. Second generation 2G cellular telecom networks were commercially launched on the GSM standard in Finland by Radio linja (now part of Elisa Oyj) in 1991. Three primary benefits of 2G networks over their predecessors were that phone conversations were digitally encrypted and 2G introduced data services for mobile, starting with SMS text messages.

3G is the third generation of mobile telecommunications technology. This is based on a set of standards used for mobile devices and mobile telecommunications use services and networks that comply with the International Mobile Telecommunications-2000 (IMT-2000) specifications by the International Telecommunication Union.

4G provides huge data rate for downlink and uplink access in addition to the usual voice and other services of 3G, mobile broadband Internet access. Continuing with 4G, 4.5G is a grouping of disparate mobile telephony and data technologies designed to provide better performance than 4G systems, as an interim step towards deployment of full 5G capability.

1.5.8 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 1.6: Introduction to Optical Communication System

Unit Objectives

At the end of this unit, students will be able to understand:

1. Need For Fiber Optic Communications
2. Optical Communication systems
3. Optical Fibers as a communication Channel
4. Optical Transmitters & Receivers

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

1.6.1 Note

This is the Fifth session of the program which talks about optical communication. Kindly explain the optical communication details to participants to enable them to perform their task effectively.

1.6.2 Say

Good morning and warm welcome to the training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

1.6.3 Do

Begin with revising the things explained in previous session. Ask the following question

- List all mobile technologies with data rate
- Discuss the need of high data rate

Encourage participants to give answers, if they have any doubt clarify it & tell them about what they are going to study in new session.

1.6.4 Say

Now let us begin a new session on the topic of Optical Communication system.

1.6.5 Do

Share the details of Optical communication system and its components to participants.

1.6.6 Elaborate

Refer Participant handbook to explain the participants about Need for Fiber optic Communications and components of optical communication system.

1.6.7 Say

Let us talk about Optical fibers as communication channel and its features.

1.6.8 Do

Share the details of Optical fibers and the significance of repeaters & WDM to participants.

1.6.9 Elaborate

Optical Communication Systems : Differ in principle from microwave systems only in the frequency range of the carrier wave used to carry the information. The optical carrier frequencies are typically 200 THz, in contrast with the microwave carrier frequencies (1 GHz). An increase in the information capacity of optical communication systems by a factor of up to 10,000 is expected simply because of such high carrier frequencies used for light wave systems.

Its characteristics are as follows:

1. A large number of electronic (digital) signals are combined using time division multiplexing (TDM) and presented to the optical transmission system as a single data stream.
2. This single data stream is carried in an optical channel at speeds ranging from 155 Mbps to 1.2 Gbps.
3. The wavelength used maximum time is almost always 1310 nm.
4. Every 30-50 km the signal is received at a repeater station, converted to electronic form, re-clocked and re-transmitted. This completely re-generates the signal (a very small amount of jitter is added to the signal but this is generally not significant). This process removes all distortions caused by noise and signal dispersion etc.

1.6.9 Elaborate Continued

5. When such a system needs to be upgraded (to run at a higher speed for example) all of the equipment in the link must be replaced. This is because the repeaters are code and speed sensitive devices.

REPEATERS: optical power reduces to only 1% after 100 km. For this reason, fiber losses remain an important design issue and determines the repeater or amplifier spacing of a long-haul light wave system. Another important design issue is fiber dispersion, which leads to broadening of individual optical pulses with propagation. If optical pulses spread significantly outside their allocated bit slot, the transmitted signal is severely degraded. Eventually, it becomes impossible to recover the original signal with high accuracy.

WDM Systems: In fiber-optic communications, wavelength-division multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals onto a single optical fiber by using different wavelengths (i.e., colors) of laser light.

1.6.10 Say

Now let us begin with new session on Optical transmitters and receivers.

1.6.11 Do

Tell the participants to get ready for an activity on optical transmitters and receivers.

1.6.12 Activity

Ask Participants to refer Participant handbook and internet to study in details about the optical transmitters and receivers.

Skill Practice	Time	Resources
• Optical transmitters & Optical Receivers	30 Min	Writing pad, Internet, Computer, PH

1.6.13 Elaborate

Optical Transmitter: The role of an optical transmitter is to convert the electrical signal into optical form and to launch the resulting optical signal into the optical fiber. Figure shows the block diagram of an optical transmitter. It consists of an optical source, a modulator, and a channel coupler.

Optical Receiver: An optical receiver converts the optical signal received at the output end of the optical fiber back into the original electrical signal. It consists of a coupler, a photo detector, and a demodulator. The coupler focuses the received optical signal onto the photo detector.

1.6.14 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Answers to exercises for PHB

Descriptive

Unit 1.1 Exercise

2. Refer Unit 1.1: Communication Systems
   Topic – 1.1.2 Basics of Communication System
3. Refer Unit 1.1: Communication Systems
   Topic – 1.1.3 Types of Communication System
4. Refer Unit 1.1: Communication Systems
   Topic – 1.1.4 Transmission Medium/ media/ channel system
5. Refer Unit 1.1: Communication Systems
   Topic – 1.1.3 Types of Communication System

Unit 1.2 Exercise

1. Refer Unit 1.2: Industry Outlooks: Global and National
   Topic – 1.2.1 Telecom Growth in India
2. Refer Unit 1.2: Industry Outlooks: Global and National
   Topic – 1.2.2 International Telecommunication Union (ITU)

Unit 1.3 Exercise

1. Refer Unit 1.3: Role and Responsibilities of GRTP and scope of GRTP
   Topic – Key tasks in a network maintenance checklist

Answers to exercises for PHB

Descriptive

Unit 1.3 Exercise (Contd.)

1. Refer Unit 1.3: Role and Responsibilities of GRTP and scope of GRTP
   Topic – Characteristics of Incentive Plan
2. Refer Unit 1.3: Role and Responsibilities of GRTP and scope of GRTP
   Topic – Job Description

Unit 1.4 Exercise

1. Refer Unit 1.4: Electromagnetic Spectrum (EMS)
   Topic – 1.4.1 Electromagnetic Spectrum
2. Refer Unit 1.4: Electromagnetic Spectrum (EMS)
   Topic – 1.4.3 Electromagnetic Wave Use and Frequency Waves
3. Refer Unit 1.4: Electromagnetic Spectrum (EMS)
   Topic – 1.4.2 Features of Electromagnetic Spectrum
4. Refer Unit 1.4: Electromagnetic Spectrum (EMS)
   Topic – 1.4.2 Electromagnetic Spectrum uses / applications

Unit 1.5 Exercise

1. Refer Unit 1.5: Mobile Technology
   Topic – 1.5.2 Overview of Mobile Technology
2. Refer Unit 1.5: Mobile Technology
   Topic – 1.5.2 Mobile Communication Technologies

Unit 1.6 Exercise

1. Refer Unit 1.6: Introduction to Optical Communication Systems
   Topic - 1.6.1 Need for Fiber Optical Communication
2. Refer Unit 1.6: Introduction to Optical Communication Systems
   Topic - 1.62 Optical Communication system
3. Refer Unit 1.6: Introduction to Optical Communication Systems
   Topic - 1.6.4 Optical Transmitters and Receivers

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2. Maintain Site Hygiene and Implement Security

Unit 2.1 – Overview of Computer Networks
Unit 2.2 – IP Addressing
Unit 2.3 – Configuring Network
Unit 2.4 – Optical Line Terminal (OLT) / Network Operation Center (NOC) – issues or up-gradation of Technology
Unit 2.5 – Equipment used at site

TEL/N6226

Key Learning Outcomes

At the end of this module, students will be able to understand :

1. Overview of Computer Networks
2. Types of Network
3. Network Topologies
4. IP Address
5. Sub-netting
6. Configuring Network Connectivity

UNIT 2.1: Overview of Computer Networks

Unit Objectives

At the end of this unit, students will be able to understand:

1. Overview of Computer Networks
2. Types of Network
3. Network Topologies

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

2.1.1 Note

This is the session of the program which talks about computer networks. Kindly explain computer network details to participants to enable them to perform their task effectively.

2.1.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

2.1.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What are the important components of optical communication system?
- What is a repeater?

Encourage participants to give answers, if they have any doubt clarify it & tell them about what they are going to study in new session.

2.1.4 Say

Now let us start new session on Computer Networks.

2.1.5 Do

Share the details of Computer networks and its classifications to participants.

2.1.6 Ask

Ask the participants whether they know about networks and internet. Ask them to explain the advantages of internet and list it on blackboard.

2.1.7 Elaborate

A network is an interconnection of a group of computers that can communicate and share resources such as hard disks and printers. This is a group of computers and other devices that are connected by some type of transmission media. The initial idea of a network was perceived by Department of Defense (DOD) in USA for the purpose of security

Local Area Networks (LANs):
A LAN is a small-scale network that extends over relatively small distances

Metropolitan area network (MAN) : A network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large local area network (LAN) but smaller than the area covered by a wide area network (WAN).

Wide Area Networks (WANs) : Provides network connectivity spanning across the large geographical area

Network Categories: The resources and software capabilities that nodes in a network share are commonly known as services.

- Peer to peer
- Client/server

Network topologies:
Network topology is a schematic layout or a map of the arrangement of nodes over a network. There are five types of network topologies are as follows: -
1. BUS 2. RING 3. Mesh 4. STAR 5. CELLULAR

2.1.8 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 2.2 : IP Addressing

Unit Objectives

At the end of this unit, students will be able to understand:

1. IP addressing
2. Subnetting

Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

2.2.1 Note

This is the Seventh session of the program which talks about IP addressing. Kindly explain the details of IP addressing to participants to enable them to perform their task effectively.

2.2.2 Say

Good Morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

2.2.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What is a network?
- What are the different types of network topologies?

Encourage participants to give answers, if they have any doubt clarify it & tell them about what they are going to study in new session.

2.2.4 Say

Let us begin a new session on IP address, its classification and features.

2.2.5 Do

Share the details of IP addressing and its features to participants.

2.2.6 Ask

Ask the participants whether they know about IP address. Ask them to give some examples of IP addresses and list it on blackboard.

2.2.7 Elaborate

IP Address: The major purpose of IP addressing is to exchange data across the network between two hosts using datagram's, or packets. Packets are broken-up independent pieces of data that consist of header and trailer information, and they contain source and delivery addresses, along with various control information. These source and destination addresses allow packets to reach the proper destination; the packets can be reassembled in the correct sequence by the receiving machine

IPv4 is 32 bit, which is divided into four blocks of each of 8 bits. Dots separate each 8 bits (octet). IP Address is composed of two distinct parts

1. Network address
2. Host address.

Ipv4 addressing is divided into five structured classes of addresses (A, B, C, D, and E), which help in identification and ease of Administration:

1. The first three classes A, B, C are the main, commercially available classes.
2. Classes D and E are the reserved for the Multicast and the research and development (R&D).

Class	1st 8 bit	2nd 8 bit	3rd 8 bit	4th 8 bit
A Class	Network address	Host address	Host address	Host address
B Class	Network address	Network address	Host address	Host address
C Class	Network address	Network address	Network address	Host address

Class	Range Address	First Three Bits
A Class	1 – 126	0
B Class	128 – 191	10
C Class	192 – 223	110

2.2.8 Do

Tell the participants to get ready for an activity on IP Address and subnet masking.

2.2.9 Activity

Ask Participants to refer Participant handbook to study in details about the importance of subnet masking and subnetting calculations

Skill Practice	Time	Resources
• Subnetting	02 Hrs	Writing pad, Computer, PH

2.2.10 Elaborate

There are loads of reasons in favor of sub-netting, including the following benefits:

Reduced Network Traffic: Without good routers, packet traffic could grind the entire network down to a near standstill. With routers, most traffic will stay on the local network; only packets destined for other networks will pass through the router.

Optimized Network Performance: This is a result of reduced network traffic. Simplified management it's easier to identify and isolate network problems in a group of smaller connected networks than within one vast network.

Facilitated spanning of the major geographical distances: Because WAN links are considerably slower and more expensive than LAN links, a single large network that spans long distances can create problems in every area previously listed. Connecting multiple smaller networks make the system more efficient.

To Create a Subnet follows these Steps:

1. Determine the number of required network Ids:
   - One for each subnet
   - One for each wide area networks connection
2. Number of required host IDs per subnet:
   - One for each TCP/IP host
   - One for each router interface
3. Based on the above requirements, create the following:
   - One subnet masks for your entire network
   - A unique subnet ID for each physical segment
   - A range of host IDs for each subnet

2.2.11 Do

Tell the participants to get ready for an activity on RJ45 crimping.

2.2.12 Activity

Ask Participants to refer Participant handbook and internet to study in details about the Crimping of RJ45.

Skill Practice	Time	Resources
• Rj45 Connectorization for straight through cable/Cross over cable	01 Hrs	Crimper, RJ45 Connectors, Ethernet Cable

2.2.13 Elaborate

Refer Participant handbook to explain the participants about the steps of crimping.

2.2.14 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 2.3 : Configuring Network

Unit Objectives

At the end of this unit, students will be able to understand

1. Configuring Network Connectivity

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

2.3.1 Note

This is the eighth session of the program which talks about Configurations of computer network. Kindly explain the network configuration details to participants to enable them to perform their task effectively.

2.3.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

2.3.3 Do

Pick some students to explain the procedure of crimping. Call a participant to do the crimping practical with the help of all others. Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

2.3.4 Say

Now let us begin a new session on Network configuration.

2.3.5 Do

Share the details of network connectivity configurations to participants.

2.3.6 Ask

Ask participants, whether they know about basic computer network configuration, if they says yes, ask to tell the procedure. Motivate them to give answer.

2.3.7 Elaborate

The networking functionality built into Windows 7 enables you to share all kind of resources with computer users. Before we can share the resources, the first thing we have to do is configure the network, what are the Hardware requirement, how to connect to the network and share the resources.

- Hardware Requirements
- Installing the Hardware
- Connecting to the Network
- Network & Sharing Center
- Troubleshooting Networks

Refer Participant handbook to explain the participant about configuration procedures.

2.3.8 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time
- Prepare Multimedia or collect multimedia pictures
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 2.4: Optical Line Terminal (OLT)/ Network Operation Center (NOC) – issues or up-gradation of technology

Unit Objectives

At the end of this unit, students will be able to understand

1. Optical Lin Terminal
2. Network Operations Center (NOC)
3. Coordinate with Gram Panchayat Officials

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

2.4.1 Note

This is the session of the program which talks about issues and upgradation of technology related to OLT /NOC. Kindly explain the need to coordinate with Gram Panchayat Officials and duties of field engineer.

2.4.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on OLT/NOC, let us revise the previous session.

2.4.3 Do

Pick some students to explain the procedure of OLT and NOC. Call a participant to explain others about his/her understanding on the subject. Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

2.4.5 Do

Share the details of OLT/NOC with participants.

2.4.6 Ask

Ask participants, whether they know about NOC Technician and its duties, if they says yes, ask to tell about it. Motivate them to give answer.

2.4.7 Elaborate

The NOC and SOC both perform vital tasks for the corporation, including identifying, looking into, and fixing problems. Both organisations put in a lot of effort to fix issues fast before they have an impact on business. Additionally, both frequently use a hierarchical method of incident resolution. They concentrate on quite dissimilar topics, though. As a result, each sets of employees have unique talents, expertise, and working methods. A NOC technician must understand the ins and outs of network and application monitoring and management, while a SOC analyst will focus exclusively on security.

Refer Participant handbook to explain the participant about details of OLT /NOC.

2.4.8 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time
- Prepare Multimedia or collect multimedia pictures
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 2.5: Equipment used at the site

Unit Objectives

At the end of this unit, students will be able to understand

1. Describe the various equipment used at site
2. Understand the wiring set up at a site for maintenance and repair

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

2.5.1 Note

This is the session of the program which talks about various equipment used at site and also about the wiring set up for maintenance and repair.

2.5.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on Oequipment used at site, let us revise the previous session.

2.5.3 Do

Explain about the Charge Controller Unit (CCU), Solar Photo Voltaic System (SPV), Telephone Junction Box (TJB), Battery Bank and Fire Extinguisher. State about the wiring set up at a site for efficient maintenance and repair.

2.5.4 Ask

Ask participants, whether they know about maintenance activities / procedures. In addition to their response, discuss and share some maintenance advice on choosing right cable , how to prevent damage and make cable reel adjustments.

2.5.5 Elaborate

Maintenance Activities / schedule:

- Select the cable that is most suited for your industry's needs. Learn about the various types of cables that are sold on the market.
- Select the cable size that is appropriate for your industry. You can check for things like mechanical strength, ambient temperature, carrying capacity, voltage loss, and safety restrictions.
- Staff should receive periodic maintenance training and education so they can recognise any failure's symptoms.
    - Keep a watchful eye on the installation of the wiring. During installation, avoid twisting or kinking the wires. It is important to lay wires as straight as you can.
    - Prevent strife and collisions.
    - Note the smallest bent radius.
    - Avoid any collisions, piercings, or crushing that could rip the wire jacket apart.
    - Keep cables and wires away from flames.

2.5.6 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time
- Prepare Multimedia or collect multimedia pictures
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Answers to exercises for PHB

Descriptive

Unit 2.1 Exercise

1. Refer Unit 2.1: Overview of Computer Networks
   Topic – 2.1.1 Overview of Computer Networks
2. Refer Unit 2.1: Overview of Computer Networks
   Topic – 2.1.2 Types of Networks
3. Refer Unit 2.1: Overview of Computer Networks
   Topic – 2.1.3 Network Topology

Unit 2.2 Exercise

1. Refer Unit 2.2: IP addressing
   Topic – 2.2.1 IP Addressing
2. Refer Unit 2.2: IP addressing
   Topic – 2.2.3 Steps to do crimping of ethernet cables
3. Refer Unit 2.2: IP addressing
   Topic – 2.2.2 Understanding of Subnetting

Unit 2.3 Exercise

1. Refer Unit 2.3: Configuring Network
   Topic – 2.3.1 Configuring Network
2. Refer Unit 2.3: Configuring Network
   Topic – 2.3.1 Configuring Network

Fill ups

Unit 2.4 Exercise

1. OLT 2. NOC 3. monitor, detect and analyze

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Telecom
Sector
Skill
Council

3. Perform Preventive Maintenance

Unit 3.1 - Fiber Optics Overview
Unit 3.2 - Light in Fiber
Unit 3.3 - Transmission of Light in Fiber
Unit 3.4 - Optical Sources
Unit 3.5 - Gigabit Passive Optical Network(GPON)
Unit 3.6 - Global Position System (GPS)
Unit 3.7 - PON Maintenance &ONT - CCU indicators
Unit 3.8 - ONT Status Check
Unit 3.9 - ONT Service Configuration
Unit 3.10 - ONT Preventive maintenance
Unit 3.11 - ONT Maintenance and Troubleshoot
Unit 3.12 - Record Repairs / Replacements

TEL/N6227

Key Learning Outcomes

At the end of this module, you will be able to understand :

1. Fiber optics basics
2. Advantages and disadvantages of fiber optics
3. Optical fiber standards
4. Fiber structure
5. Glass as a medium
6. Transmission capacity
7. Fiber refractive index profiles
8. Polarization and interference
9. Chromatic dispersion and propagation mode
10. Snell's Law and critical angle
11. Noise and loss
12. Optical sources
13. LED classifications
14. Lasers classification
15. Light sources
16. Optical radiation

UNIT 3.1: Fiber Optics Overview

Unit Objectives

At the end of this unit, you will be able to understand:

1. Fiber optics basics
2. Advantages and disadvantages of optical fiber
3. Optical fiber standards

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

3.1.1 Note

This is the ninth session of the program which talks about fiber optic basics. Kindly explain the fiber optic details to participants to enable them to perform their task effectively.

3.1.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.1.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What is a network?
- What are the different types of network topologies?

Encourage participants to give answers. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.1.4 Say

Let us start a new discussion on History of fiber optics.

3.1.5 Ask

Ask to participants, whether they know about the optical fibers and its features. If they say yes, ask them to list that features on black board. Ask them to compare it with the conventional transmission channels.

3.1.6 Do

Share the details about overview of fiber optics to the participants.

3.1.7 Elaborate

Refer Participant handbook to explain the evolution of fiber optics technology.

3.1.8 Do

Share with the participants about the advantages and disadvantages of optical fiber.

3.1.9 Elaborate

Advantages of Optical fiber:

- Low Power Loss - An optical fibre offers low power loss. This allows for longer transmission distances.
- Interference - Fibre optic cables are immune to electromagnetic interference.
- Size - In comparison to copper, a fibre optic cable has nearly 4.5 times as much capacity as the wire cable has and a cross sectional area that is 30 times less.
- Weight - Fibre optic cables are much thinner and lighter than metal wires. They also occupy less space with cables of the same information capacity.
- Safety - Since the fibre is a dielectric, it does not present a spark hazard.
- Security - Optical fibers are difficult to tap. As they do not radiate electromagnetic energy, emissions cannot be intercepted
- Flexibility - An optical fibre has greater tensile strength than copper or steel fibres of the same diameter.
- Cost - The raw materials for glass are plentiful, unlike copper. This means glass can be made more cheaply than copper.
- Extremely high bandwidth – No other cable-based data transmission medium offers the bandwidth that fiber does.

3.1.9 Elaborate Continued

- Easy to accommodate increasing bandwidth – Using many of the recent generations of fiber optic cabling, new equipment can be added to the inert fiber cable that can provide vastly expanded capacity over the originally laid fiber.
- Resistance to electromagnetic interference – Fiber has a very low rate of bit error (10 EXP-13)

Disadvantages:

- Cost - Cables are expensive to install but it lasts longer than copper cables.
- Fragile - Fibers can be broken or have transmission losses when wrapped around curves of only a few centimeters radius.
- Protection - Optical fibers require more protection around the cable compared to copper.
- Installation costs, while dropping, are still high – Despite the fact that fiber installation costs are dropping by as much as 60% a year, installing fiber optic cabling is still relatively costly.
- Special test equipment is often required – The test equipment typically and traditionally used for conventional electron-based networking is of no use in a fiber optic network.
- Susceptibility to physical damage – Fiber is a small and compact cable, and it is highly susceptible to becoming cut or damaged during installation or construction activities.
- Wildlife damage to fiber optic cables – Many birds, for example, find the Kevlar reinforcing material of fiber cable jackets particularly appealing as nesting material, so they peck at the fiber cable jackets to utilize bits of that material.

3.1.10 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time
- Prepare Multimedia or collect multimedia pictures
- Collect Videos, Prepare some question & answer before taking a class
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.2 : Light in Fiber

Unit Objectives

At the end of this unit, students will be able to understand :

1. Fiber structure
2. Glass as a medium
3. Transmission capacity
4. Fiber refractive index profiles

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

3.2.1 Note

This is the tenth session of the program which talks about light in fiber. Kindly explain the light propagation details to participants to enable them to perform their task effectively.

3.2.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.2.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What are the benefits of using Optical fiber?
- What are the limitations of optical fiber?

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.2.4 Say

Let us start a new session on Optical fiber structure.

3.2.5 Do

Share details of physical structure and refractive Index of optical fibers to participants.

3.2.6 Elaborate

Fiber is essentially a waveguide for light. It uses a principal known as "Total Internal Reflection". Fiber cables are internally composed of two layers: Known as the "core" and the "cladding". The cladding layer has a higher index of refraction than the core. When light tries to pass from a lower to a higher index of refraction, at the correct angle, it is reflected back instead. This causes light to be continuously reflected back into the core, allowing the light to travel to the other end of the fiber.

Optical Fiber Sizes

The international standard for outer cladding diameter of most single-mode optical fibers is 125 microns (µm) for the glass and 245 µm for the coating. This standard is important because it ensures compatibility among connectors, splices, and tools used throughout the industry. Standard single-mode fibers are manufactured with a small core size, approximately 8 to 10 µm in diameter. Multimode fibers have core sizes of 50 to 62.5 µm in diameter.

Refractive index profile

A refractive index profile is the distribution of refractive indices of materials within an optical fiber. Some optical fiber has a step-index profile, in which the core has one uniformly-distributed index and the cladding has a lower uniformly-distributed index. Other optical fiber has a graded-index profile, in which the refractive index varies gradually as a function of radial distance from the fiber center. Graded-index profiles include power-law index profiles and parabolic index profiles.

For an optical fiber, a step-index profile is a refractive index profile characterized by a uniform refractive index within the core and a sharp decrease in refractive index at the core-cladding interface so that the cladding is of a lower refractive index. The step-index profile corresponds to a power-law index profile with the profile parameter approaching infinity. The step-index profile is used in most single-mode fibers and some multimode fibers.

A step-index fiber is characterized by the core and cladding refractive indices n1 and n2 and the core and cladding radii a and b. Examples of standard core and cladding diameters 2a/2b are 8/125, 50/125,62.5/125, 85/125, or 100/140 (units of µm). The fractional refractive-index change $= n_1 - n_2 /1 <<$ The value of n1 is typically between 1.44 and 1.46, n^1 is typically between 0.001 and 0.02. Step-index optical fiber is generally made by doping high-purity fused silica glass (SiO2) with different concentrations of materials like titanium, germanium, or boron.

3.2.7 Do

Share the details of light propagation and transmission capacity of optical fibers to participants.

3.2.8 Ask

Ask to participants, whether they know about properties of light. If they say yes, ask them to list that features on black board.

3.2.9 Elaborate

Light Propagation

Visible light extends from 380 nm (violet) to 780 nm (red), for smaller wavelengths ultra-violet radiation (UV) occurs. Longer wavelengths correspond to the infrared region (IR). Optical Fibres communication elements operate in the micrometer wavelength zone of the frequency spectrum (frequencies between 1014Hz to 1015 Hz).

Refraction of Light:

This section presents the study of the phenomenon interactively. Input parameters, the refractive indices of the two media and the angle of incidence can be varied and the propagation of light can be studied.

Light Guidance:

This section presents the interactive study of the light propagation through the fibers. By varying the refractive indices of the medium in front of the fiber, medium inside the fiber, medium of the cladding of the fiber and the angle of incidence, the passage of light in the meridional plane through the fiber can be traced.

Technology and Maximum Bandwidth	
Techology	**Maximum Bandwidth**
Fiber Optics	10 Gbps (and beyond with DWDM)
Laser	1 Gbps
Ethernet	1 Gbps
ATM	622 Mbps (and beyond)
Microwave	155 Mbps
Satellite	155 Mbps (Experimental 622 Mbps)
Ultra Wideband	100 Mbps
LMDS	100 Mbps
TechNet's Recommendation	100 Mbps / Home or Small Business
VDSL	520 Mbps
Cable Codes	30 Mpbs
ADSL	9 Mbps
HDSL	2 Mbps
E1 leased line	2 Mbps
ISDN PRI	2 Mbps
Frame Relay	2 Mbps - specs up to 62 Mbps
ISDN BRI	128 Kbps
Analog	56 Kbps

3.2.10 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.3: Light Propagation and Related Losses

Unit Objectives

At the end of this unit, students will be able to understand :

1. Polarization
2. Interference
3. Chromatic dispersion
4. Propagation Modes
5. Snell's Law
6. Propagation Modes

Resources to be Used

Available objects such as a duster, pen, notebook, projector & other teaching aids
Presentation slides

- Multimedia

3.3.1 Note

This is the eleventh session of the program which talks about Light propagation and related losses in fiber. Kindly explain the Fiber optic losses details to participants to enable them to perform their task effectively

3.3.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.3.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What are the important elements of optical fiber?
- What is refractive Index?

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.3.4 Say

Now let us start a new session on Light propagation and related loss.

3.3.5 Do

Share with participants polarization, interference and Dispersion to participants.

3.3.6 Elaborate

Refer participant hand book to explain more details on polarization, interference and Dispersion to participants.

3.3.7 Do

Share the details of Snell's law and critical angle to participants.

3.3.8 Activity

Ask Participants to refer Participant handbook and practice the calculation exercise by using Snell's law and derive the equation of Critical angle from definition.

Skill Practice	Time	Resources
• Snell's law, Critical angle Calculations practice	01 Hrs	Writing pad, Internet, Computer, PH

3.3.9 Elaborate

Refer Participant handbook to explain participants about Snell's law and critical angle.

3.3.10 Say

Let us start a new session on Noises and Losses in optical fiber communication.

3.3.11 Do

Share the details of noises & losses in optical fibers to participants.

3.3.12 Elaborate

Noise is defined as the deviation from an ideal signal, and is usually associated with random processes. By definition it corrupts the information content and fidelity of the signal, particularly at low levels. In our case, we will be dealing with voltage noise, current noise, and optical intensity noise.

Noise can be classified in a number of ways.

1. Intrinsic or Extrinsic
2. Random or Coherent
3. Additive or Multiplicative
4. Stationary
5. Ergotis

Fiber Loss Mechanisms

Optical beam power traveling along the fiber decreases exponentially with distance. There are different optical fiber losses mechanisms:

1. Rayleigh scattering,
2. Absorption,
3. Macroscopic and microscopic bends,
4. Simulated nonlinear scattering.

3.3.13 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.4 : Optical Sources

Unit Objectives

At the end of this unit, students will be able to understand :

1. Optical Sources
2. LED Classifications
3. LED Output Characteristics
4. Laser Output Characteristics
5. Light Sources
6. Optical radiation

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids

3.4.1 Note

This is the twelfth session of the program which talks about optical sources. Kindly explain the optical source details to participants to enable them to perform their task effectively.

3.4.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.4.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What are the loss mechanism occurred in optical fiber?
- What are the classifications of noise?
- Explain polarization

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.4.4 Say

Now let us start a new session on optical source.

3.4.5 Do

Share the details of light generation in industry to participants.

3.4.6 Elaborate

Taking the most general view, there is only one way that light can be produced: that is, through the rapid change of state of an electron from a state of relatively high energy to a (more stable) state of lower energy. When this happens the energy has to go somewhere and it is often34 emitted in the form of light. Of course, this almost always takes place in the context of a particular material and Structure. The electron concerned could be bound within a molecule (albeit loosely) or it could be relatively free within the material.

Electrical Discharge

When an electric current is passing through a gas(such as neon), energy from the current “ionizes” (breaks the chemical bonds in) the gas. This process injects energy into electrons within the gas and when these electrons are reclaimed into molecules energy is given off in the form of light.

Electric Current

This is different from electrical discharge. This is the principle involved in semiconductor lasers and LEDs. An electric current applied to a semiconductor p-n junction requires that electrons and holes recombine at the junction. This recombination results in electrons going from the high energy “conduction” band to the lower more stable “valence” band. This can result in either spontaneous emission or lasing depending on how the device is constructed

3.4.7 Do

Share the details of LED and Lasers to participants.

3.4.8 Elaborate

Light Emitting Diodes (LEDs)

Almost all light sources used in communications today are made from semiconductors. Light Emitting Diodes are simpler than lasers but have a lot in common with them.

Characteristics of LEDs

Low Cost

LEDs have been very low in cost compared to communication lasers. This is highly controversial. Communication LEDs and lasers are not too different in their structures and are comparable in manufacturing cost.

Low Power

The maximum light output of an LED has typically been a lot lower than that of a laser (about 100 microwatts). However, recently a new class of LEDs, with output of up to 75 millwatts, has become available.

Relatively Wide Spectrum Produced

LEDs do not produce a single light wavelength but rather a band of wavelengths. The range (or band) of wavelengths produced is called the "spectral width" and is typically about .05 of the wavelength (50 to 100 nm)

Incoherent Light

The light produced is neither directional nor coherent. This means that you need a lens to focus the light onto the end of a fiber. LEDs are not suitable for use with single-mode fiber for this reason (it is too hard to get the light into the narrow core).

Digital Modulation

LEDs cannot produce pulses short enough to be used at gigabit speeds. However, systems using LEDs operate quite well at speeds of up to around 300 Mbps.

Lasers

LASER is an acronym for "Light Amplification by the Stimulated Emission of Radiation". Lasers produce far and away the best kind of light for optical communication.

The key principle in laser operation is the principle of stimulated emission.

1 An electron within an atom (or a molecule or an ion) starts in a low energy stable state often called the "ground" state.
2. Energy is supplied from outside and is absorbed by the atomic structure whereupon the electron enters an excited (higher energy) state.
3. A photon arrives with energy close to the same amount of energy as the electron needs to give up reaching a stable state. (This is just another way of saying that the wavelength of the arriving photon is very close to the wavelength at which the excited electron will emit its own photon.)
4. The arriving photon triggers a resonance with the excited atom. As a result the excited electron leaves its excited state and transitions to a more stable state giving up the energy difference in the form of a photon.

3.4.9 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Key Learning Outcomes

At the end of this module, students will be able to understand :

1. NOFN overview
2. GPON definition
3. GPON basic architecture
4. GPON principle
5. GPON– devices
6. OLT- Features & Functions
7. ONT – Features & Functions
8. Splitter – Features & Functions
9. CCU – Features & Functions
10. GPON installation procedure
11. GPON end to end connectivity
12. IP configuration – OLT & ONT
13. GPON service connectivity diagram
14. GPS

UNIT 3.5 : Gigabit Passive Optical Network (GPON)

Unit Objectives

At the end of this unit, students will be able to understand :

1. Bharath net/ NFON vision and mission
2. GPON architecture and design

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

3.5.1 Note

This is the twenteith session of the program which talks about GPON. Kindly explain the GPON details to the participants to enable them to perform their task effectively.

3.5.2 Say

Good morning and warm welcome to the training program Grass Root Telecom Provider. Before begin a new session let us revise the previous session.

3.5.3 Do

Begin with revising the things explained in previous session. Ask the following question

- List all optical transmission bands and its range
- List all optical network components

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.5.4 Say

Let us start a new session on Gigabit Passive Optical Network (GPON).

3.5.5 Do

Share the details of NOFL/ Bharath net to participants.

3.5.6 Elaborate

The National Optical Fibre Network (NOFN),now Bharath net is a project initiated in 2011 and funded by Universal Service Obligation Fund to provide broadband connectivity to over two lakh (200,000) Gram panchayats of India at a cost of Rs.20,000 crore ($3 billion).Government of India has given approval of the project on 25-10- 2011. The project provides internet access using existing optical fiber and extending it to the Gram panchayaths. The project was intended to enable the government of India to provide e-services and e- applications nationally.

A special purpose vehicle Bharat Broadband Network Limited (BBNL) was created as a Public Sector Undertaking (PSU) under the Companies Act of 1956 for the execution of the project. The project will be funded by the Universal Service Obligation Fund (USOF) .The GPON order for BBNL to connect 200,000 villages is awarded to United Telecoms Limited (UTL).

NOFN Implementation

The Indian government approved a cabinet note on the scheme to create the National Optical Fiber Network dated 25 October 2011. The implementation framework, budget, technology architecture and other issues related to NOFN were worked out by a high level committee constituted by the Department of Telecom (DoT) under the chairmanship of an adviser to the Prime Minister and Chairman UIDAI (constituted on 26 April 2011).

3.5.7 Do

Share the details of GPON services and its Principle to participants.

3.5.8 Elaborate

Passive optical network is a telecommunications technology that implements a point-to-multipoint architecture (P2MP), in which unpowered Fiber Optic Splitters are used to enable a single optical fiber to serve multiple end-points such as customers, without having to provision individual fibers between the hub and customer.

Gigabit Passive Optical Network (GPON) technology node is the access necessary to deliver multimedia services (voice, data, video and other content-content) for residential and business customers.

3.5.8 Elaborate Continued

PON - Key Elements

ODN : Optical Distribution Network an ODN realizes the optical transmission from the OLT towards the users and vice versa. It utilizes passive optical components.

OLT : Optical Line Termination service provider endpoint of a PON and is placed in a CO or head end.

ONT : Optical Network Termination ONT is a device that terminates the PON and presents native service interfaces to the user. An ONT is typically located on the customer's premises.

ONU : Optical Network Unit an ONU is the PON-side half of the ONT, terminating the PON, and may present one or more converged interfaces, such as XDSL or Ethernet, toward the user. An ONU typically requires a separate subscriber unit to provide native user services such as telephony

3.5.9 Do

Share the details of GPON services and its Principle to participants.

3.5.10 Elaborate

Passive optical network is a telecommunications technology that implements a point-to-multipoint architecture (P2MP), in which unpowered Fiber Optic Splitters are used to enable a single optical fiber to serve multiple end-points such as customers, without having to provision individual fibers between the hub and customer.

Gigabit Passive Optical Network (GPON) technology node is the access necessary to deliver multimedia services (voice, data, video and other content-content) for residential and business customers.

GPON-based FTTx technology below:

1. FTTH (Fiber to the Home)
2. FTTB (Fiber to the Building)
3. FTTZ (Fiber to the Zone)
4. FTTT (Fiber to the Tower)
5. FTTC (Fiber to the Curb)

GPON Principle

Data Multiplexing

GPON adopts Wavelength Division Multiplexing (WDM) technology, facilitating bi-direction communication over a single fiber. To separate upstream/downstream signals of multiple users over a single fibre, GPON adopts two multiplexing mechanism:

1. In Downstream direction, data packets are transmitted in a broadcast manner;
2. In Upstream direction, data packets are transmitted in a TDMA manner.

Refer participant handbook to get more details on GPON.

3.5.11 Do

Share the details of GPON standards to participants.

3.5.12 Elaborate

Refer participant handbook to get more details of following standards.

- **ITU-T G.984.1**
- **ITU-T G.984.2**
- **ITU-T G.984.3**
- **ITU-T G.984.4**

3.5.13 Do

Share the details of GPON devices and its feature to participants

3.5.14 Elaborate

Refer participant handbook to get more details on the following GPON devices and its features.

- OLT
- ONT
- CCU
- SPV

3.5.15 Do

Share the details of ONT installation to participants.

3.5.16 Elaborate

Refer participant handbook to explain ONT installation.

3.5.17 Do

Share the details of GPON design to participants.

3.5.18 Elaborate

Refer participant handbook to explain Ethernet & GPON design.

3.5.19 Do

Tell the participants to get ready to do activities on GPON elements.

3.5.20 Activity

- Set guidelines pertaining to discipline
- Make groups and show case ONT hardware, CCU –SPV hardware, OLT hardware to each groups
- Showcase the functionality of EMS & NMS and ask them to work on the different features of these applications

Skill Practice	Time	Resources
• Show case ONT hardware Show case CCU-SPV hardware Show case EMS ,NMS applications • Show case OLT hardware and Cards	05 Hrs	ONT,ONU,CCU-SPV,OLT,EMS and NMS Software BSNL Exchange Site visit or any other exchange as per availability

3.5.21 Elaborate

Refer Participant handbook to Explain more about GPON.

3.5.22 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.6: Global Positioning System (GPS)

Unit Objectives

At the end of this unit, students will be able to understand :

1. Global Position System (GPS)
2. GPS - utility and application

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

3.6.1 Note

This is the twenty-first session of the program which talks about GPS. Kindly explain the GPS details to participants to enable them to perform their task effectively.

3.6.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.6.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What is NOFN?
- What are the components of Passive optical networks?
- What are the GPON devices? Explain its features

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.6.4 Say

Let us begin a new session on GPS, which is very important in every field surveys using for tracking.

3.6.5 Ask

Ask participant whether they know about GPS and its applications. if they say yes, ask them to list all advantages and applications of GPS in communication system.

3.6.6 Do

Share the details of GPS (Global position System) to participants.

3.6.7 Elaborate

GPS Navigation

Navigation is a field of study that focuses on the process of monitoring and controlling the movement of a craft or vehicle from one place to another. The field of navigation includes four general categories: land navigation, marine navigation, aeronautic navigation, and space navigation. Refer fig

- Once map or compass screen comes up:
- Start walking. You must be moving for navigation mode to work.
- Turn so compass points to top of unit or the arrow points down the map track.
- When you get close, Switch to coordinate screen to find final coordinates.
- GPS usually has a 5 to 10 meter error, more in poor conditions.
- Mark where the GPS takes you and search a 10 meter full circle around the point.

3.6.8 Do

Tell the participant to get ready for the activity on GPS devices.

3.6.9 Activity

Makes groups on the name of different GPON networks and ask them to find out different coordinates by navigation mode of GPS.
Ask them to calibrate the GPS device.

Skill Practice	Time	Resources
• Find out the coordinates position in the center premises. • Calibrate device using Known position coordinates.	02 Hrs	GPS Module, Compass, Standard GPS device

3.6.10 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Key Learning Outcomes

At the end of this module, students will be able to understand :

1. PON maintenance and troubleshoot
2. Features of ONT hardware
3. ONT – LED identity
4. CCU monitoring panel indicators

UNIT 3.7 : PON Maintenance & ONT – CCU Indicators

Unit Objectives

At the end of this unit, students will be able to understand :

1. PON maintenance and troubleshoot
2. Features of ONT hardware
3. ONT – LED identity
4. CCU monitoring panel indicators

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

3.7.1 Note

This is the twenty-second session of the program which talks about PON maintenance and ONT-CCU indicators. Kindly explain PON maintenance and the Indicators details to participants to enable them to perform their task effectively.

3.7.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.7.3 Do

Begin with revising the things explained in previous session. Ask the following question

- What is GPS?
- What are the steps of GPS NAVIGATION?

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.7.4 Say

Let us begin a new session of PON maintenance and troubleshooting.

3.7.5 Do

Share the details of PON maintenance and troubleshooting steps to participants.

3.7.6 Elaborate

Point-to-Point FTTx Network

When a failure occurs on a point-to-point FTTx network, the network completely shuts down. It is then easy to disconnect the fiber without further affecting the customer issue. To troubleshoot and fix FTTx network problems, an Optical Time Domain Reflectometry (OTDR) test can be performed with any test wavelength, such as 1310 or 1550 nm as the transmission signals are shut down.

Point-to-Multipoint FTTH Network (PON) Topology

Troubleshooting a point-to-multipoint fiber-to-the-home (FTTH) network (also defined as a PON network) differs significantly. The International Telecommunications Union (ITU-T) and Institute of Electrical and Electronic Engineers (IEEE) have created several standards for optical access systems based on PON architecture (G.982, G.983 or G.984 for ITU and 802.3ah or 802.3av for IEEE).
In order to troubleshoot PON networks in service, two dedicated tools are available:

-PON power meter
-In-service 1625 or 1650 nm OTDR

Traffic wavelengths are typically 1310/1490 or 1310/1490/1550 nm. A PON power meter is normally employed to verify that the signal is transmitted correctly to and from the ONT. A PON meter measures the power levels of all the signals and can then discriminate whether the issue comes from the customer's ONT or from the network. The use of a classical OTDR with 1310 or 1550 nm test wavelengths would interfere with the traffic signals and disturb the traffic. At the same time, the traffic signals could also disturb the receiver of the OTDR, making it difficult to interpret OTDR traces. Because of these mutual disturbances, classical OTDRs cannot be used, and specific in-service OTDRs are required (see section on Specific In-service Portable OTDR Device).

Recommended Steps for locating faults

Despite the fact companies with diverse fiber networks have their own methods and procedures, most of them optimize their fault location process to reduce the number of truck rolls.

The schematic in Figure 7 offers a complete view of:

1. All of the possible fault locations, depending on how many customers are affected
2. The best location to shoot an OTDR while minimizing truck rolls
3. Whether or not a specific in-service OTDR device should be used

Complete PON Test Tools

Installation Phase

The following equipment may be used:

1. Loss test set (provides insertion loss and ORL, either uni-directionally or bi directionally)
2. OTDR

3.7.6 Elaborate Continued

Turn-up Phase

The following equipment should be used in conjunction:

1. A PON power meter (1310/1490, 1490/1550, or 1310/1490/1550 nm)
2. IP testers (voice, data, video) and coaxial testers

Maintenance and Troubleshooting Phase

The following equipment should be used in conjunction:

1. A PON power meter (1310/1490, 1490/1550, or 1310/1490/1550 nm)
2. A loss test set or an OTDR
3. IP testers (voice, data, video) and coaxial testers

3.7.7 Say

Let us start a new session on Features of ONT Hardware

3.7.8 Do

Share the details of ONT hardware features to participants.

3.7.9 Elaborate

Functions and features-ONT11

- **In Upstream direction** - ONT11 connects to OLT in the network through a passive optical network (PON) port to provide integrated access service
- **In Downstream direction**
    - - ONT11 connects with LAN Switches, PC, and STB etc. through Ethernet ports, to access data and video services
    - .- RJ11 ports are provided on ONT to connect phone or fax through POTS interfaces for extending Voice and FAX services

3.7.9 Elaborate Continued

.**System Management Interfaces**

- System management has been provided through two standardized interfaces:
- Local Management Interface: The local manager is able to install, monitor, control and configure the GPON system.
- EMS Interface: A GUI based Element Management System is provided to control and monitor the GPON system. This EMS interacts with the GPON system using standard SNMP V3 protocol. The EMS is able to support all the functions like Operation, Administration, and maintenance.

Battery level

- Various levels are displayed through LEDs as shown below:
  - 100 – 75: Battery charged level is between 75 to 100 % and the LED will be ON Green.
  - 5 – 50: Battery charged level is between 50 to 75 % and the LED will be ON Green.
  - 50 – 25: Battery charged level is between 25 to 50 % and the LED will be ON Green.
  - Low: Battery charged level is below 25 % and the LED will be RED.
    the ONT will be off or otherwise if ONT is on the same should be made off if both the inputs are absent.
- Current and Voltage monitoring points are also provided on the CCU panel. These monitoring points help to measure the voltage and current for various requirements like Mains output, Solar output, CCU load (ONT Input) and Battery.

Battery Indications

- Mains Charge: Amber LED should be ON when battery is being charged through AC.
- Mains I/P Normal: AC mains are in operating range the LED will be ON & Green.
- Mains I/P over Voltage: AC voltage above the operating voltage level; LED is RED.
- Mains I/P under Voltage: AC voltage below the operating voltage level; LED is RED.
- Mains O/P OL: High current is being derived on AC mains.
- Mains O/P OV: High voltage is being delivered for battery charging; LED is RED.
-
- Solar Panel Reverse: When SPV panel wires are connected with reverse polarity the LED will be RED.
- Solar Charge: Amber LED should be ON when battery is being charged through Solar Input.
- Solar OV / Fault: This shows the either the Solar panel voltage is high or not available. The LED will be RED in such conditions.
- Battery Reverse: If LED is RED, this indicates that the Battery is connected in reverse polarity and action is required accordingly.

3.7.10 Do

Tell the participants to get ready to do activities on ONT hardware

3.7.11 Activity

- Play some relevant videos giving graphical representation on different types of FTTX
- Field visit to nearby BSNL office and understand different PON elements and its functionalities
- Execute and understand the Connectorization of PON networks by the guidance of BSNL executives

Skill Practice	Time	Resources
• Field Visit to BSNL office • Understand PON elements and its features • Execute Connectorisation & maintenance procedure by taking the guidance from the officers • Demo on ONT service Configuration	04 Hrs	Field visit

3.7.11 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Key Learning Outcomes

At the end of this unit, students will be able to understand :

1. ONT Status Check
2. LED Verification
3. CCU Status Verification
4. ONT Service Configurations
5. ONT Preventive Maintenance
6. ONT Registration Failures and Solutions

UNIT 3.8 : ONT Status Check

Unit Objectives

At the end of this unit, students will be able to understand :

1. ONT Status Check
2. LED Verification
3. CCU Status Verification
4. ONT Service Configurations
5. ONT Preventive Maintenance
6. ONT Registration Failures and Solutions

Resources to be Used

- Available objects such as a duster, pen, projector & other teaching aids
  Presentation slides
- Multimedia

3.8.1 Note

This is the twenty-third session of the program which talks about ONT status check. Kindly explain the ONT status check details to participants to enable them to perform their task effectively.

3.8.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.8.3 Do

Begin with revising the things explained in previous session. Ask the following question

- How do you identify ONT status?
- What are the connectivities available in ONT devices?
- List all services offered by ONT
- Explain ONT site survey Procedure.

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.8.4 Say

Let us start a new session on ONT services and Maintenance.

3.8.5 Do

Share the details of ONT status check to participants.

3.8.6 Elaborate

Refer participant handbook to explain ONT status check to participants.

3.8.7 Do

Tell the participants to get ready for the activity on ONT services.

3.8.8 Activity

- Set guidelines pertaining to discipline
- Field Visit to real time GPON functioning site (GP)
- Make groups and show case ONT hardware, CCU –SPV hardware, OLT hardware to each groups.
- Showcase the functionality CCU coupler Unit and Identify the ONT - LED status

Skill Practice	Time	Resources
• Show case ONT hardware, CCU – SPV hardware, OLT hardware to each groups. • Showcase the functionality CCU Coupler Unit and Identify the ONT - LED status	02 Hrs	Demonstration on GPON

3.8.9 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.9 : ONT Service Configuration

Unit Objectives

At the end of this unit, students will be able to understand :

1. ONT Service Configuration

Resources to be Used

- Available objects such as a duster, pen, projector & other teaching aids
  Presentation slides
- Multimedia

3.9.1 Note

This is the twenty-fourth session of the program which talks about ONT service configuartion. Kindly explain the ONT configuration details to participants to enable them to perform their task effectively.

3.9.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provide. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.9.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Define ONT
- Define CCU

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.9.4 Say

Let us begin a new session on ONT service Configuration.

3.9.5 Do

Share the details of ONT service configurations.

3.9.6 Elaborate

Refer Participant handbook to explain the different service configurations in ONT.

3.9.7 Do

Tell the participant to get ready for the activity.

3.9.8 Activity

- Set guidelines pertaining to discipline
- Showcase and explain ONT service configurations

Skill Practice	Time	Resources
• Show case and explain ONT Service Configurations 1. IP TV Configuration 2. Wifi Configuration 3. PPPoE Configuration 4. High Speed Internet Service Configuration	02 Hrs	Demonstration on GPON

3.9.9 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.10 : ONT Preventive Maintenance

Unit Objectives

At the end of this unit, students will be able to understand :

1. ONT Preventive & Patrolling Maintenance

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

3.10.1 Note

This is the twenty-fifth session of the program which talks about ONT preventive maintenance. Kindly explain ONT preventive maintenance details to participants to enable them to perform their task effectively.

3.10.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.10.3Do

Begin with revising the things explained in previous session. Ask the following question

- Explain ONT Wi-Fi configuration
- Explain IP TV configurations

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.10.11Say

Let us begin a with a new topic ONT preventive maintenance.

3.10.12 Do

Share the details of ONT preventive maintenance to participants.

3.10.13 Ask

Ask the participants whether they know about Do's and Don'ts at the work field. If they say yes, ask them to write the do's and don'ts on black board.

3.10.14 Elaborate

Refer Participant handbook to explain in details about preventive maintenance.

3.10.15 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.11 : ONT Maintenance and Troubleshoot

Unit Objectives

At the end of this unit, students will be able to understand :

1. ONT - Registration failures and solutions

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides

3.11.1 Note

This is the twenty-sixth session of the program which talks about ONT maintenance and troubleshoot. Kindly explain the ONT maintenance and troubleshoot details to participants to enable them to perform their task effectively.

3.11.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

3.11.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Explain patrolling practices of handling optical fibers

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.11.4 Say

Let us start a new session on ONT Maintenance and trouble shooting.

3.11.5 Do

Share the details of ONT registration failures and solution to participants.

3.11.6 Activity

- Set guidelines pertaining to discipline
- Field Visit to real time GPON functioning site (GP)
- Demonstrate and explain ONT Failing and solutions

ONT registration Failures

Skill Practice	Time	Resources
• Demonstrate and explain ONT Failing and solutions ONT registration Failures	04 Hrs	Active ONT at GP

3.11.7 Elaborate

Refer Participant handbook to explaining details about ONT Maintenance and troubleshooting.

3.11.8 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 3.12 : Record Repairs / Replacements

Unit Objectives

At the end of this unit, students will be able to understand :

1. Record repairs/replacements undertaken during fault rectification

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids Presentation slides

3.12.1 Note

This is the session of the program which talks about record repairs/replacements undertaken during fault rectification. Kindly explain the significance of recording and storing the data.

3.11.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session, let us revise the previous session.

3.11.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Explain about ONT maintenance and troubleshoot

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

3.11.4 Say

Let us start a new session on record repairs/replacements undertaken during fault rectification.

3.12.5 Do

Share the details of reports to be maintained on frequent basis to ensure status updates

3.12.6 Elaborate

Refer Participant handbook to explaining details about ONT Maintenance and troubleshooting.

3.12.7 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Answers to exercises for PHB

Descriptive

Unit 3.1 Exercise

1. Refer Unit 3.1: Fibre Optics Overview
   Topic – 3.1.1 History of Fibre Optics
2. Refer Unit 3.1: Fibre Optics Overview
   Topic – 3.1.2 dvantage and Disadvantages of Optical Fiber
3. Refer Unit 3.1: Fibre Optics Overview
   Topic – 3.1.3 Optical Fibre Standards

Unit 3.2 Exercise

1. Refer Unit 3.2: Light in Fibre
   Topic – 3.2.1 Fiber Structure
2. Refer Unit 3.2: Light in Fibre
   Topic – 3.2.2 Fibre Glass as medium
3. Refer Unit 3.2: Light in Fibre
   Topic – 3.2.4 Fibre Refractive Index Profiles

Unit 3.3 Exercise

1. Refer Unit 3.3: Light Propagation and Related Losses
   Topic – 3.3.1 Polarization and 3.3.2 Interference
2. Refer Unit 3.3: Light Propagation and Related Losses
   Topic 3.3.3 Chromatic Dispersion
3. Refer Unit 3.3: Light Propagation and Related Losses
   Topic 3.3.5 Snell's Law
4. Refer Unit 3.3: Light Propagation and Related Losses
   Topic 3.3.6 Critical ngle
5. Refer Unit 3.3: Light Propagation and Related Losses
   Topic 3.3.8 Noise and Loss

Unit 3.4 Exercise

6. Refer Unit 3.4: Optical Sources
   Topic - 3.4.2 LED
7. Refer Unit 3.4: Optical Sources
   Topic - 3.4.3 Laser
8. Refer Unit 3.4: Optical Sources
   Topic - 3.4.4 Optical Light Guides

Unit 3.5 Exercise

1. Refer Unit 3.5:GPON
   Topic 3.5.1 GPON (pg 105)
2. Refer Unit 3.5:GPON
   Topic 3.5.1 GPON (pg 107)
3. Refer Unit 3.5:GPON
   Topic 3.5.1 GPON (pg 84)
4. Refer Unit 3.5:GPON
   Topic 3.5.1 GPON (pg 106)
5. Refer Unit 3.5:GPON
   Topic 3.5.1 GPON (pg 91)

Answers to exercises for PHB

Descriptive

Unit 3.5 Exercise (Contd.)

6. Refer Unit 3.5:GPON
Topic 3.5.1 GPON (pg 105)
7. Refer Unit 3.5:GPON
Topic 3.5.1 GPON (pg 93)
8. Refer Unit 3.5:GPON
Topic 3.5.1 GPON (pg 95)
9. Refer Unit 3.5:GPON
Topic 3.5.1 GPON (pg 106)
10. Refer Unit 3.5:GPON
Topic 3.5.1 GPON (pg 87)

Unit 3.6 Exercise

1. Refer Unit 3.6:Global Positioning System (GPS)
Topic 3.6.1 Global Positioning System (GPS)
2. Refer Unit 3.6:Global Positioning System (GPS)
Topic 3.6.1 Global Positioning System (GPS) (pg 119)
3. Refer Unit 3.6:Global Positioning System (GPS)
Topic 3.6.1 Global Positioning System (GPS) (pg 120 -122)

Unit 3.7 Exercise

1. Refer Unit 3.7:PON Maintenance & ONT - CCU Indicators
Topic 3.7.1 PON Maintenance & ONT - CCU Indicators
2. Refer Unit 3.7:PON Maintenance & ONT - CCU Indicators
Topic 3.7.3 ONT LED and Its Identity
3. Refer Unit 3.7:PON Maintenance & ONT - CCU Indicators
Topic 3.7.2 Features of ONT Hardware
4. Refer Unit 3.7:PON Maintenance & ONT - CCU Indicators
Topic - CCU Monitoring Panel Indicators (Pg 136)
5.Refer Unit 3.7:PON Maintenance & ONT - CCU Indicators
Topic CCU Monitoring Panel Indicators (Pg 136 - 138)

Unit 3.8 Exercise

1. Refer Unit 3.8: ONT Status Check
Topic 3.8.1 ONT Status Check
2. Refer Unit 3.8: ONT Status Check
Topic 3.7.2 Features of ONT Hardware
3. Refer Unit 3.8: ONT Status Check
Topic 3.8.1 Charge Couple Unit (CCU Status Verification)
4.Refer Unit 3.8: ONT Status Check
Topic 3.8.1 ONT Status Check - LED Verification
5. Refer Unit 3.8: ONT Status Check
Topic 3.8.1 Charge Couple Unit (CCU Status Verification)

Unit 3.9 Exercise

1.Refer Unit 3.9: ONT Service Configuration
Topic 3.9.1 HSI Service Configuration
2. Refer Unit 3.9: ONT Service Configuration
Topic 3.9.4 Configuration of i-Fi Service

Answers to exercises for PHB

Descriptive

Unit 3.9 Exercise (Contd.)

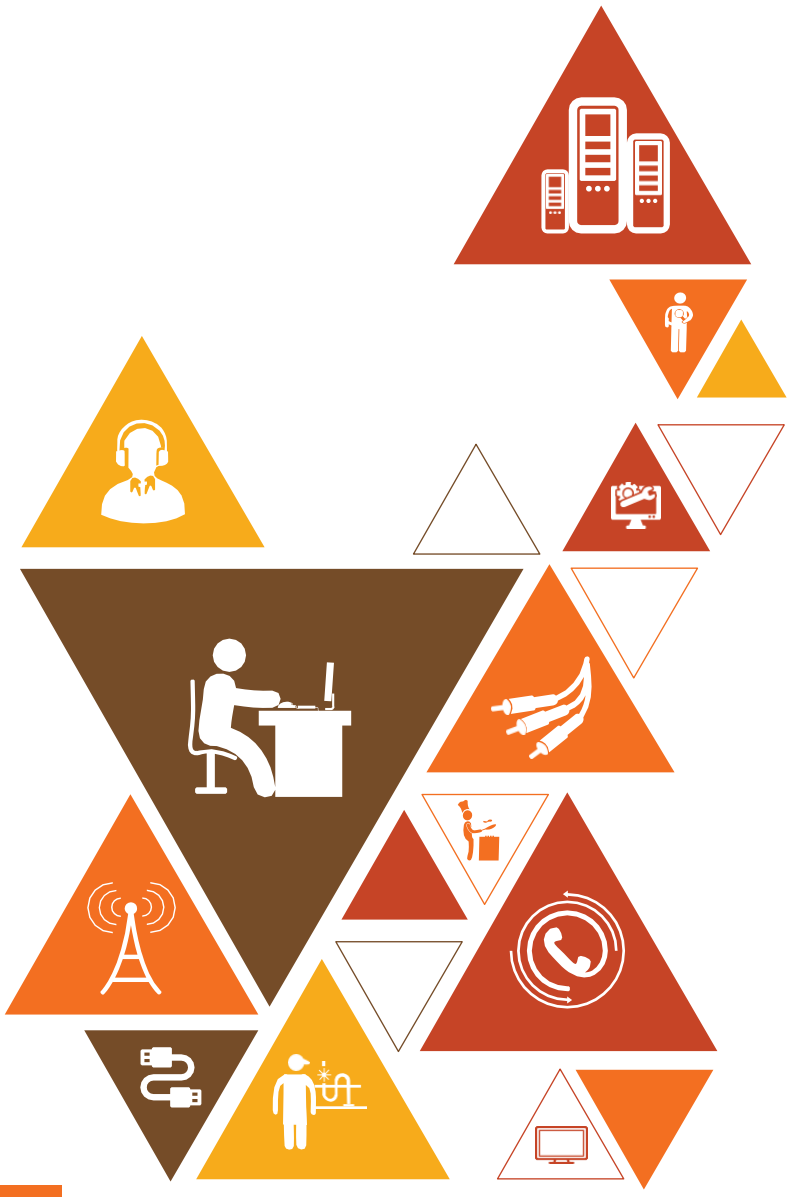
3. Refer Unit 3.9: ONT Service Configuration
Topic 3.9.5 IPTV Configuration
4. Refer Unit 3.9: ONT Service Configuration
Topic 3.9.6 Phone(voice)/F Service Configuration

Unit 3.10 Exercise

1.Refer Unit 3.10: ONT Preventive Maintenance Topic
Topic 3.10.1 ONT Preventive Measurements
2.Refer Unit 3.10: Preventive Maintenance
Topic 3.10.1 ONT Preventive Measurements (pg 165)

Unit 3.11 Exercise

1.Refer Unit 3.11: ONT Maintenance and Troubleshoot
Topic 3.11.1 ONT- Registrations Failures and Solutions
2.Refer Unit 3.11: ONT Maintenance and Troubleshoot
3.Topic 3.11.1 ONT- Registrations Failures and Solutions



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N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Telecom
Sector
Skill
Council

4. Promote Usage of Telecom Devices & Provide Services

Unit 4.1 - Approach to Common Service Centers (CSC)

Unit 4.2 - Digital Devices & Digital Approaches

Unit 4.3 - Monitoring & Maintenance of Electrical Systems

Unit 4.4 - Revenue Management and Record Maintenance

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Key Learning Outcomes

At the end of this unit, students will be able to understand :

1. CSC outreach Programme
2. Network for Information & Communication Technologies(NICT) for CSC
3. ISP
4. Broadband
5. Digitization in India
6. Digital devices
7. Apps & Related Devices
8. E Services
9. E Terminal & kiosk
10. Utility apps links
11. Electrical systems & its types
12. Batteries & Power Banks
13. UPS
14. Electrical Maintenance
15. Revenue Management & Record Maintenance

UNIT 4.1: Approach to Common Service Centers

Unit Objectives

At the end of this unit, students will be able to understand :

1. Common Service centers (CSC) Outreach Programme
2. Network for Information & Communication technologies(NICT) for CSC
3. Internet Service Providers (ISP)
4. Broadband

Resources to be Used

- Available objects such as a duster, pen, notebook, projector & other teaching aids
  Presentation slides
- Multimedia

4.1.1 Note

This is the twenty-seventh session of the program which talks about approach to common service centers. Kindly explain the common service centers details to participants to enable them to perform their task effectively.

4.1.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

4.1.3 Do

Begin with revising the things explained in previous session. Ask the following question

- List the ONT dos and don'ts

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

4.1.4 Say

Let us begin a new session on approach to common service centers (CSC).

4.1.5 Do

Share the details of service centers Outreach program and NICT cash collection centers to participants.

4.1.6 Elaborate

Common service centers are providing various govt. services to people like Certificates (Birth, Death, Domicile, caste, Income etc) MNREGA payments, NIELIT's CCC courses and non-government service, Bank account opening, withdrawal/ deposit, loan document, online railways, and airline ticket booking, DTH recharge, etc. It includes an exhibition van which is giving hand on experience about various public services available through this Centre. While other interesting elements of the exhibition like nukkad natak, audio visual experience and VLE assistance is educating people about convenience and transparency of services available through CSCs.

Common service centers are part of National e-governance plan which is a major initiative of the Government of India for ushering in e-Governance for improving the quality of basic governance, on a massive scale in areas of concern to the common man. The vision of NeGP is to "Make all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency & reliability of such services at affordable costs to realize the basic needs of the common man".

Vision of CSC SPV

To develop CSCs as a dependable, reliable, and ubiquitous IT enabled network of Citizen Service Points connecting local population with the Government departments, business establishments, banks and insurance companies and educational institutions, with an impact on primary, secondary and tertiary sectors of the country's economy.

Role of CSC SPV

Ensure ubiquitous presence of citizen service points in all geographies, in line with the vision of 'Digital India' and to operationalize CSCs across States/UTs. Support GOI / States/ UTs to enable delivery of G2C services. Facilitate integration of e-Governance services (Central/State MMPs) portals and NIC driven applications. Support State Designated Agencies (SDAs) in setting up of state CSC portals using requisite API integration with payment gateway, etc.

Objectives of CSC 2.0

Non-discriminatory access to e-Services for rural citizens by making CSCs complete service delivery centers, utilizing the infrastructure already created in terms of other Mission Mode Projects. Expansion of self-sustaining CSC network till the Gram Panchayat level – 2.5 lakh CSCs, i.e. at least one CSC per Gram Panchayat, more than one preferred. Empower District e-Governance Society (DeGS) under the district administration for implementation.

4.1.6 Elaborate Continued

NICT Cash Collection Centers

Network for Information and Communication Technology's (NICT) is an Indian non-governmental organization that has been working in the field of technology solutions for better service delivery. The SDA of Madhya Pradesh - Madhya Pradesh State Electronics Development Corporation (MPSEDC) - appointed NICT as the Service Centre Agency (SCA) for establishing CSCs in 2158 locations in Indore and Ujjain, Madhya Pradesh.

4.1.7 Ask

Ask participant whether they know about ISP's, If yes ask them to list major ISPs in their region. Ask them about the features of broadband and list it on blackboard and explain in details.

4.1.8 Do

Share with participant about Internet service providers and broadband.

4.1.9 Elaborate

Internet Service Provider

An Internet service provider (ISP) is an organization that provides services accessing and using the Internet. Internet service providers may be organized in various forms, such as commercial, community- owned, non-profit, or otherwise privately owned. Internet services typically provided by ISPs include Internet access, Internet transit, and domain name registration, web hosting, Usenet service and colocation. ISPs provide Internet access, employing a range of technologies to connect users to their network. Available technologies have ranged from computer modems with acoustic couplers to telephone lines, to television cable (CATV), wireless Ethernet (wi-fi), and fiber optics. For users and small businesses, traditional options include copper wires to provide dial-up, DSL, typically asymmetric digital subscriber line (ADSL), cable modem or Integrated Services Digital Network (ISDN) (typically basic rate interface). Using fiber-optics to end users is called Fiber to The Home or similar names.

4.1.9 Elaborate Continued

Broadband

In telecommunications, broadband is wide bandwidth data transmission which transports multiple signals and traffic types. The medium can be coaxial cable, optical fiber, radio, or twisted pair. In the context of Internet access, broadband is used to mean any high-speed Internet access that is always on and faster than traditional dial-up access.

In telecommunications, a broadband Signaling method is one that handles a wide band of frequencies. "Broadband" is a relative term, understood according to its context. Wider (broader) the bandwidth of a channel then greater the information carrying capacity of the channel. In radio, for example, a very narrow band will carry Morse code, a broader band will carry speech, and a still broader band will carry music without losing the high audio frequencies required for realistic sound reproduction. This broad band is often divided into channels or "frequency bins" using pass band techniques to allow frequency-division multiplexing instead of sending a higher-quality signal.

In data communications, a 56k modem will transmit a data rate of 56 kilobits per second (Kbit/s) over a 4- kilohertz-wide telephone line (narrowband or voice band). In the late 1980s, the Broadband Integrated Services Digital Network (B-ISDN) used the term to refer to a broad range of bit rates, independent of physical modulation detail

4.1.10 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 4.2: Digital Devices and Digital Approaches

Unit Objectives

At the end of this unit, students will be able to understand :

1. Digitization in India
2. Digital Devices
3. Apps & Related Devices
4. E Services
5. E terminal & Kiosk
6. Utility Apps Links

Resources to be Used

- Available objects such as a duster, pen, projector & other teaching aids
  Presentation slides
- Multimedia

4.2.1 Note

This is the twenty-eighth session of the program which talks about digital devices and digital approaches. Kindly explain the electrical system details to participants to enable them to perform their task effectively.

4.2.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

4.2.3 Do

Begin with revising the things explained in previous session. Ask the following question

- List all ISPs in India
- What is Broadband?

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

4.2.4 Say

Let us start a new topic that is Digitization in India.

4.2.5 Do

Share the details of Digitization in India to participants.

4.2.6 Ask

Ask participants whether they know about digital India project, if yes ask them to explain the project aim and details

4.2.7 Elaborate

Refer to Participant handbook and internet to explain Digitization in India

4.2.8 Say

Let us a start a new session on Digital devices and applications

4.2.9 Do

Share the details of digital devices and related Applications.

4.2.10 Elaborate

Refer Participant handbook to explain the following

1. Desktop
2. Laptop
3. Smart phones
4. OS – (Android, Apple IOS, Windows)
5. Tablets

4.2.11 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 4.3: Monitoring & Maintenance of Electrical System

Unit Objectives

At the end of this unit, students will be able to understand :

1. Electrical Systems & its types
2. Batteries & Power banks
3. UPS
4. Electrical Maintenance

Resources to be Used

- Available objects such as a duster, pen, projector & other teaching aids
  Presentation slides
- Multimedia

4.3.1 Note

This is the twenty-ninth session of the program which talks about monitoring and maintenance of electrical system. Kindly explain the electrical system details to participants to enable them to perform their task effectively.

4.3.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

4.3.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Explain need of smart smartphones and Apps.
- Discuss digitization in India

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

4.3.4 Say

Let us begin a new session of monitoring and maintenance of Electrical systems.

4.3.5 Do

Share the details of Electrical systems and its types to participants.

4.3.6 Elaborate

Refer Participant handbook to explain about electrical systems and its types.

4.3.7 Say

Let us discuss on batteries and Power banks using in GPON.

4.3.8 Do

Share the details of batteries and power bank using in GPON to participants..

4.3.9 Elaborate

A battery is an electrochemical cell (or enclosed and protected material) that can be charged electrically to provide a static potential for power or released electrical charge when needed. A battery generally consists of an anode, a cathode, and an electrolyte. Common types of commercial batteries and some of their characteristics and advantages are summarized in the following table. Battery types not shown include the Zinc-Air, Flooded Lead Acid, and Alkaline batteries.

CCU & SPV

Power to ONT is derived from AC mains, Solar panel & battery bank. CCU – charge coupler unit consists of controller board, battery and serge boards for AC mains and solar panel. SPV is single integrated switch mode power supply that can work in both single-phase AC mains input as well as solar photovoltaic panel output (SPV)

Solar panel

The SPV is mounted & fixed onto the specialty designed module mounting structure. The orientation of SPV panel mounted on a structure can be adjusted in 2 axes

UPS

The Uninterruptible power supply (UPS) is an online power protection system that prevents loss of valuable electronic information, minimizes equipment downtime, and minimizes the adverse effect on equipment production because of unexpected power problems.

4.3.10 Say

Let us start a new discussion on Electrical maintenance.

4.3.11 Do

Share the details of Electrical maintenance to participants.

4.3.12 Elaborate

The electrical maintenance technician installs or repairs equipment that has electrical components either on site or at centralized repair facilities. Maintenance electricians use testing devices to discover problems with wiring, fixtures, or other electrical equipment. They replace or repair the defective elements using various types of hand or power tools.

Refer Participant handbook to explain following

1. Equipment handling
2. Precautions
3. Testing and Status Check
4. Do's & Don'ts in Electrical Operations
5. Health & Safety Precautions

4.3.13 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

UNIT 4.4: Revenue Management and record maintenance

Unit Objectives

At the end of this unit, you will be able to understand:

1. Revenue Management and Record Maintenance

Resources to be Used

- Available objects such as a duster, pen, projector & other teaching aids
- Presentation slides
- Multimedia

4.4.1 Note

This is the thirtieth session of the program which talks about Revenue management and record maintenance. Kindly explain the safety details to participants to enable them to perform their task effectively.

4.4.2 Say

Good morning and warm welcome to this training program on Grass Root Telecom Provider. Before begin a new session on electromagnetic spectrum, let us revise the previous session.

4.4.3 Do

Begin with revising the things explained in previous session. Ask the following question

- Explain UPS.
- What are the do’s and don'ts in electrical operations?

Encourage participants to give answer. If they have any doubt, clarify it and tell them about what they are going to study in new session.

4.4.4 Say

Let us start a new session on Revenue Management and Record Maintenance.

4.4.5 Do

Share the details of revenue management and record maintenance to participants.

4.4.6 Elaborate

Refer Participant handbook to explain the details of revenue management and record maintenance.

4.4.7 Notes for Facilitation

- Maintain a teaching pace appropriate to the students because they are learning these technical topics from a practical viewpoint for the first time.
- Prepare Multimedia or collect multimedia pictures.
- Collect Videos, Prepare some question & answer before taking a class.
- Prepare PPT & some revised previous topic & Current topic.

Answers to exercises for PHB

Descriptive

Unit 4.1 Exercise

1. Refer Unit 4.1: pproach to Common Service Centers (CSC)
   Topic – 4.1.1 Outreach Programme
2. Refer Unit 4.1: pproach to Common Service Centers (CSC)
   Topic 4.1.2 System for Information & Communication Technologies (NICT) Cash Collection Centers
3. Refer Unit 4.1: pproach to Common Service Centers (CSC)
   Topic 4.1.3 Internet Service provider
4. Refer Unit 4.1: pproach to Common Service Centers (CSC)
   Topic 4.1.4 Broadband

Unit 4.2 Exercise

1. Refer 4.2 : Digital Devices & Digital pproaches
   Topic - 4.2.1 Digitization in India
2. Refer 4.2 : Digital Devices & Digital pproaches
   Topic - 4.2.1 Digital Devices
3. Refer 4.2 : Digital Devices & Digital pproaches
   Topic - 4.2.1 Smart Phones
4. Refer 4.2 : Digital Devices & Digital pproaches
   Topic - 4.2.1 pps & Related Devices Continued
5. Refer 4.2 : Digital Devices & Digital pproaches
   Topic - 4.2.2 E terminal & iosk
6. Refer 4.2 : Digital Devices & Digital pproaches
   Topic - 4.2.3 E Services

Unit 4.3 Exercise

1. Refer 4.3 : Monitoring & maintenance of Electrical Systems
   Topic - 4.3.1 Electrical Systems & its types
2. Refer 4.3 : Monitoring & maintenance of Electrical Systems
   Topic - 4.3.2 Batteries & Power banks
3. Refer 4.3 : Monitoring & maintenance of Electrical Systems
   Topic - 4.3.3 UPS
4. Refer 4.3 : Monitoring & maintenance of Electrical Systems
   Topic - 4.3.4 Electrical Maintenance
5. Refer 4.3 : Monitoring & maintenance of Electrical Systems
   Topic - 4.3.4 Do's & Don'ts in Electrical Operations
6. Refer 4.3 : Monitoring & maintenance of Electrical Systems
   Topic - 4.3.4 Health & Safety Precautions.

Unit 4.4 Exercise

1. Refer 4.4 : Revenue Management and record maintenance
   Topic - 4.4.1Revenue Management and record maintenance

Answers to exercises for PHB

Descriptive

Unit 4.4 Exercise (Continued)

2. Refer 4.4 : Revenue Management and record maintenance
Topic - 4.4.1 Revenue Management and record maintenance (pg 211)
3. Refer 4.4 : Revenue Management and record maintenance
Topic - 4.4.1 Revenue Management and record maintenance (pg 212)
4. Refer 4.4 : Revenue Management and record maintenance
Topic - 4.4.1 Revenue Management and record maintenance (pg 213)

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4. Plan work effectively Organize Resources and Implement safety Practices

Unit 4.1 – Work Place Health and Safety

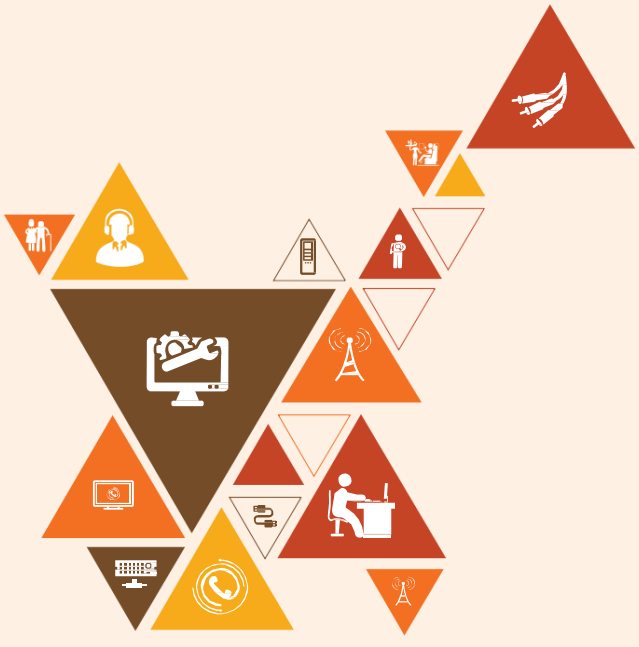
Unit 4.2 – Different types of Health Hazards

Unit 4.3 - Importance of safe working Places

Unit 4.4 - Reporting Safety Hazards

Unit 4.5 - Waste Management

unit 4.6 - Organization's focus on Greening of Jobs



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KKey Learning Outcomes

At the end of this module, you will be able to:

1. Explain about workplace health and safety
2. understand different types of health hazards
3. Demonstrate various first-aid techniques
4. Understand the importance of safety at workplace
5. understand basic hygiene practices and hand washing techniques
6. Explain the need for Social Distancing
7. Understand the hazard reporting methods at workplace
8. Explain e-waste and process of disposing them
9. Explain the greening of jobs

UNIT 4.1: Workplace Health and Safety

Unit Objectives

At the end of this unit, the participants will be able to:

1. Understand about workplace health and safety
2. Explain tips to design a safe workplace
3. Explain precautions to be taken at a workplace

Resources to be Used

- Participant handbook, white board marker pen, notebook, whiteboard, flipchart, laptop, overhead projector, laser pointer, etc.

Notes

- In this unit, we will discuss about workplace health & safety.

Say

Good morning and welcome back to this training program on Telecom E-Waste Handler.
In this session, we will discuss about workplace health & safety practices.

Ask

Ask the trainees the following questions:

- What do you understand by workplace safety?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson.

Say

In this session, we will discuss the following points:

- Safety: Tips to design a safe workplace
- Non-Negotiable employee safety habits

Let us participate in an extempore activity to understand this unit better.

Activity

- This activity will be based on individual performance.
- Provide each trainee with a printout/Xerox copy of the safety hazard report
- Now ask each of them to fill up the report individually
- After completing, collect all the forms and evaluate them
- End the session by providing constructive feedback

Activity	Duration (in mins)	Resources Used
Role-play – Safety Hazard Report	40 minutes	Participant handbook, whiteboard, notebook, laptop, pen, pencil, marker, printout/Xerox copy of safety hazard report, etc.

Do

- Ensure that the report contains all possible hazards in the workplace, safety measures, and ways to counter the hazards if they occur
- Guide the trainees throughout the activity
- Ask the trainees if they have any questions
- Encourage other trainees in the class to answer it and encourage peer learning in the class
- Explain the consequences of not following the safety guidelines at the workplace

UNIT 4.2: Different types of Health Hazards

Unit Objectives

At the end of this unit, participants will be able to:

1. Understand the health hazards
2. Demonstrate First Aid Techniques

Resources to be Used

- Participant handbook, pen, notebook, whiteboard, markers, flipchart, laptop, overhead projector, laser pointer, equipment and tools, safety signs and symbols, safety equipment

Notes

- In this unit, we will discuss about different types of health hazards and first aid techniques

Say

- Good morning and welcome back to this training program on Telecom E-Waste Handler. In this session, we will discuss about different types of health hazards.

.

Ask

Ask the trainees the following questions:

- What is a health hazard?
- Can you name any health hazards that may occur at the workplace?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson.

Notes for Facilitation

Illness, injuries, and pain are part of human life. This can happen anyway. Every individual is prone to illness and injuries at anytime and anywhere.
In case of any of these, some kind of immediate medical attention or treatment is needed to reduce the discomfort, pain, and deterioration of the condition

Explain the first aid techniques for injuries due to various causes. For burns, electric shock, fracture due to accidental fall etc.
Explain the concept of CRP and give a demonstration using a video how to administer CRP for a patient suffering a heart attack.
Through a demonstration explain the use of various safety gadgets used in the workplace.

Say

In this session, we will discuss the following points:

- First aid
- First aid techniques
  - For burns
  - For broken bones and fractures
  - For heart attack/stroke
  - For head injury
- Using breathing apparatus
- Briefing and guidance for firefighters
- Evacuation process
- Special evacuation requirements for specially-abled persons
- Importance of fire safety drills

Let us participate in an activity to understand this unit better.

Activity

- This session will be in the form of a "Show and Explain " activity.
- In this activity, bring a few PPE (relevant to the job role) to the class and demonstrates each of them - safety helmet, safety goggles, gloves, ear muff, respirator, harness, safety boots, etc.
- Now ask the trainees to identify the PPE and state their usage
- After the session, you will select a few volunteers and make them wear PPEs.
- The focus of this activity is to select and use appropriate personal protective equipment compatible with the work and compliant with relevant occupational health and safety guidelines.

Activity	Duration (in mins)	Resources Used
Practical activity - PPE	40 minutes	Participant handbook, laptop, overhead projector, internet connection, various protective equipment like safety helmet, safety goggles, gloves, ear muff, respirator, harness, safety boots, etc.

Do

- Ensure that all trainees participate in the activity
- Share your inputs and insight to encourage the trainees and add to what they talk about

Summarize

- Ask the participants what they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the different health hazards and video demo of how to wear the PPE kits and first aid techniques.

UNIT 4.3: Importance of safe working practices

Unit Objectives

At the end of this unit, participants will be able to:

1. Explain Basic Hygiene Practices
2. Understand the importance of Social Distancing
3. Demonstrate the safe working practices

Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

Notes

- In this unit, we will discuss about the importance of safe working practices.

Say

Good morning and welcome back to this training program on Telecom E-Waste Handler.
In this session, we will discuss about the importance of safe working practices

Ask

Ask the trainees the following questions:

- List a few personal hygiene tips that you regularly follow.
- How social distancing helps to reduce the spread of Covid 19?
- What are the various covid protocols people followed during the pandemic?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

- Basic hygiene practices
    - Personal hygiene
    - Personal hygiene practices at home
- Importance of social distancing
    - Social distancing and isolation
    - Self-quarantine
    - Disposing off the PPE kits
- Safe workplace practices
    - Supplies and Accessories in the first aid box
    - CPR

Say

- Let us participate in a practical activity to understand this unit better.

Notes for Facilitation

- Familiarize the trainees with the first aid box and the supplies inside it.
- Explain the importance of first aid and why is it good to know how to administer CRP for a patient who has suffered a heart attack.
- Answer all the questions/doubts raised by the trainees in the class
- Encourage other trainees to answer queries/questions and boost peer learning in the class

Practical

- Gather all the trainees in the laboratory and divide them into groups of two
- Ask each group to demonstrate the correct process for performing CRP
- Ensure the students follow all the steps of CPR in the correct sequence
- This activity can also be performed on a dummy, if available

Activity	Duration (in mins)	Resources Used
Practical activity - CPR	60 minutes	Participant handbook, whiteboard, notebook, laptop, pen, marker, dummy (if available), etc.

Do

- Prepare in advance and use appropriate energisers
- Encourage the students to explore how the training session can help them improve their work
- Keep the ambience constructive and positive
- Ensure each contribution is given fair consideration

UNIT 4.4: Reporting Safety Hazards

Unit Objectives

At the end of this unit, participants will be able to:

1. Discuss the process of reporting in case of emergency (safety hazards)
2. Understand methods of reporting hazards

Resources to be Used

Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

Say

Good morning and welcome to this training program on Customer Care Executive (Repair Centre)
In this session, we will discuss about reporting safety hazards.

Ask

Ask the trainees the following questions:

- What is a safety hazard?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

- Methods of reporting safety hazards
- Describing hazard matrix
- Hazard report form

Say

Let us participate in an activity to understand this unit better.

Notes for Facilitation

- Explain the trainees about reporting the safety hazards to the people concerned.
- Explain the 6C's of communication protocols followed in the organizations.
    - Communicate First
    - Communicate Rightly
    - Communicate Credibly
    - Communicate Empathetically
    - Communicate to instigate appropriate action
    - Communicate to promote respect
- Explain about the Hazard report form
- Ask the trainees if they have any questions
- Encourage other trainees to take part in the activity and encourage peer learning in the class
- Discuss the exercises at the end of the chapter in the Participant Handbook and encourage them to answers.

Activity

- Divide the class into small groups
- Conduct a quiz and ask questions related to the unit
- Display all questions on the projector screen
- Display the correct answer after all groups have got their chances of answering a given question

Activity	Duration (in mins)	Resources Used
Quiz – Interpreting Signs	40 minutes	Laptop, internet connection, overhead projector, white screen, whiteboard, markers, laser pointer

Do

- Ask a student to maintain the scores on the whiteboard
- Jot down the crucial points on the whiteboard as the students speak
- Share your inputs and insight to encourage the students and add to what they talk about
- Ensure that all students participate in the class
- Ask a student to summarise what was discussed in the session
- Demonstrate enthusiasm for the subject matter, course and participant's work

UNIT 4.5: Waste Management

Unit Objectives

At the end of this unit, participants will be able to:

1. explain what is e-waste?
2. Understand the concept of waste management
3. Explain the process of recycling e-waste

Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

Say

Good morning and welcome back to this training program on Telecom Customer Care Executive (Repair Centre).
In this session, we will discuss about waste management.

Ask

Ask the trainees the following questions:

- What do you understand by waste management?
- What are the sources of medical waste?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

- Introduction to e-waste
  - What is e-waste?
- Electronic goods/gadgets are classified under three major heads
- E-waste management process
- Recyclable and non-recyclable waste
- Colour codes of waste collecting bins
- Waste disposal methods
- Sources of waste
- Source of Pollution
- Types of Pollution – Air, Water, Soil, Noise, Light

Say

Let us participate in an extempore activity to understand this unit better.

Activity

- This activity will be based on individual performance.
- In this activity, you will give two topics to the trainees
- The first topic in this session will be air pollution.
- The second topic on which the trainees will prepare their extempore will be on waste disposal method.
- You will randomly pick up trainees and separate them into two groups.
- Ensure that the trainees are equal in number.
- Allot the trainees 2 minutes to prepare the topic you will give them.
- After the time is up, you will call out any trainee and ask them to speak on the topic for 5 minutes.
- The trainee, with a simple explanation but rich content, will be appreciated with accolades.

Activity	Duration (in mins)	Resources Used
Extempore	40 minutes	Participant Handbook, Whiteboard, Notebook, Pen, Pencil, Marker, etc.

Do

- Do a de-briefing of the activity
- Conduct a doubt clarification session if needed.
- Encourage the quiet and shy trainees to open up and speak

Notes for Facilitation

- Encourage other participants to answer it and encourage peer learning in the class
- Answer all the doubts in case any of the participants

UNIT 4.6: Organization's focus on Greening of Jobs

Unit Objectives

At the end of this unit, participants will be able to:

1. Understand the concept of ESG
2. Explain the different factors of ESG

Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

Say

Good morning and welcome back to this training program on Telecom Customer Care Executive (Repair Centre).
In this session, we will discuss about greening of Jobs

Ask

Ask the trainees the following questions:

- What is ESG?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

- What is ESG?
  - ESG stands for Environmental, Social, and Governance.
  - Environmental, social, and governance (ESG) investing refers to a set of standards for a company's behaviour used by socially conscious investors to screen potential investments.
  - Investors are increasingly applying these non-financial factors as part of their analysis process to identify material risks and growth opportunities.
- Factors of ESG
  - Environmental
  - Social
  - Governance

Say

Let us participate in a group discussion to explore the unit a little more.

Activity

- Conduct a group discussion in the class on the factors of ESG
- Ask the participants what they have learnt from this exercise
- Ask if they have any questions related to what they have talked about so far
- Close the discussion by summarising the importance of the ESG in recent times

Activity	Duration (in mins)	Resources Used
Group Discussion	45 minutes	Participant Handbook, Whiteboard, Notebook, laptop, Pen, Pencil, Marker, microphone and speakers etc.

Do

- Do a de-briefing of the activity
- Conduct a doubt clarification session if needed.
- Encourage the quiet and shy trainees to open up and speak
- Ensure a friendly and cordial atmosphere during the group discussion
- Give chance to each and everybody to give their opinion
- Guide the students in identifying key points

Notes for Facilitation

- Encourage other participants to answer it and encourage peer learning in the class
- Answer all the doubts in case any of the participants
- Discuss the proper combination technique in group discussion
- Make sure everybody understood the concept of greening of Jobs

Ask

- If they can, why can't you?
- Discuss concepts related to 'Creativity and Innovation' with the participants as given in the Participant Handbook.

Say

- Recall the stories on motivation.
- What is the inner drive that motivates people to succeed?
- Let's learn more about such creative and innovative entrepreneurs with the help of an activity.

Team Activity

- This is a group activity.
- Think of any one famous entrepreneur and write a few lines about him or her.

Activity De-brief

- Why did you choose this particular entrepreneur?
- What is his/her brand name?
- What creativity does he/she possess?
- What was innovative about their ideas?

Do

- Conduct a doubt clarification session if needed.
- Encourage the non-participating trainees to open up and speak

Summarize

- Summarize the unit by asking participants if they know of some people who are highly creative and innovative in their approach.
- Ask them to share some experiences about these people with the class.

Notes for Facilitation

- Source for stories on innovations:

http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-Indians/20151208.htm

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& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Telecom
Sector
Skill
Council

5. Communication & Interpersonal Skills

Unit 5.1 - Interaction with supervisors, peers and Customers

Unit 5.2 - Explain the importance of developing sensitivity towards differently abled people

TEL/N9102

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand what communication is and the importance of communication in the workplace
2. Understand effective communication and how to communicate effectively for success
3. Discuss types of communication - verbal and non-verbal
4. Communicate at workplace
5. Communicate effectively with superiors
6. Communicate effectively with colleagues and customers using different modes viz face-to-face, telephonic and email communication
7. Understand the hurdles to effective communication
8. Conduct professionally at the workplace
9. Respect differences in gender and ability
10. Communicate effectively with a person with disabilities
11. Show respect for disabled people

UNIT 5.1: Interaction with supervisor, peers and customers

Unit Objectives

At the end of this unit, the participants will be able to:

4. Understand the importance of communication
5. Understand types of communication

Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, equipment and tools

Notes

- In this unit, we will discuss how to communicate effectively with supervisor, peers and customers

Say

Good morning and welcome to this training program on Customer Care Executive (Repair Centre)
In this session, we will discuss about effective communication with supervisor, peers and customers

Ask

Ask the trainees the following questions:

- What is communication?
- What is non-verbal communication?
- What are the barriers to effective communication?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson

Elaborate

In this session, we will discuss the following points:

- What is communication?
- Why is communication important?
- Effective communication
    - Effective communication for success
    - Significance of clear and effective communication
- Types of communication
    - Verbal communication
    - Non-Verbal communication
        - Signs and symbols
        - Gestures and expressions
- Communication at workplace
    - Communication with supervisors
    - Communication with colleagues & customers
    - Face-to-face communication
    - Telephonic communication
    - Email communication
- Importance of timely completion of tasks
- Standard operating procedure
- Escalation matrix
    - Escalation mechanism
    - Escalation through CRM
- Escalation Issues at work
    - What does it mean to escalate an issue at work?
    - When should you escalate an issue at work?
- Hurdles for effective communication
- Professional conduct
- Respect gender differences
- Communication with a disabled person
    - Communicating with people with a hearing impairment
    - Respect People with disability
    - Safety at the workplace for people with disability
        - Responsibilities of an employer towards disabled people
- Workplace adaptations for people with disability
    - Workplace adaptations

Say

In this session, we will discuss the following points:

Let us participate in the activity to understand all about effective communication

Activity

Scenario 1:

- This is an activity involving two. One volunteer as boss and the other as team member
- Provide the trainees with a scenario mentioned below
- You are the boss for a team of 15 members. You want to convey your displeasure regarding the performance of one of your team member. How would you convey this to him/her
- State what measures you will take to convey this matter to them.

Scenario 2:

- This is an activity involving two. One volunteer as boss and the other as team member
- Provide the trainees with a scenario mentioned below
- You are the boss for a team of 15 members. You want to appreciate one of your team mate's performance. He closed a big business deal of Rs.1 cr. How would you do?
- State what measures you will take to appreciate to them.

Activity	Duration (in mins)	Resources Used
Mock activity	60 minutes	Participant handbook, whiteboard, laptop, notebook, pen, pencil, marker, etc.

Do

- Ensure that all trainees participate in the class.
- Encourage the non-participating trainees to open up and speak.
- Do a de-briefing for this activity. You tell them, scolding is always done in private, one to one, whereas appreciation is always done in open in front of others, for them to feel happy about it and at the same time others get motivated to give their best performance.

Notes for Facilitation

- Ask them to answer the questions given in the participant manual.
- Ensure that all the participants answer every question.
- Answer all the doubts raised by the trainees in the class
- Discuss the proper communication technique in all the class activity

UNIT 5.2: Explain the importance of developing sensitivity towards differently abled people

Unit Objectives

At the end of this unit, participants will be able to:

3. Communicate Effectively with person with disabilities
4. Respect people with disability, at workplace

Resources to be Used

- Participant handbook, pen, notebook, whiteboard, markers, flipchart, laptop, overhead projector, laser pointer, equipment and tools

Notes

- In this unit, we will discuss about how to communicate effectively with people who has disabilties

Say

- Good morning and welcome back to this training program on Telecom Customer Care Executive (Repair Centre).
- In this session, we will discuss about how to communicate with people who are differently abled

.

Ask

Ask the trainees the following questions:

- What is an effective communication?
- Have they ever got an opportunity to help/assist a disabled person?

Write down the trainees' answers on the whiteboard/flipchart.
Draw appropriate cues from the answers and start teaching the lesson

.

Notes for Facilitation

A **disability** is any condition that makes it more difficult for a person to do certain tasks or interact with the people around them (socially or materially). These conditions, or defects, may be cognitive, developmental, intellectual, mental, physical, sensory, or a combination of multiple conditions

As a co-worker, one should be empathetic with them and talk to them politely and with respect. Every work place has guidelines for handling these kinds of people. And all employees need to adhere to those guidelines.

Say

In this session, we will discuss the following points:

- What is a disability
- General tips for communication with disabled people
- Respect people with disability
- Work place safety for people with disability
- Work place adaptation by people with disability

Do

- Ensure that all trainees have understood the purpose of this module
- Encourage them to participate in the discussion

Summarize

- Ask the participants what they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Explain them how to interact with differently abled people, respect them and assist and support them to complete their work if need be.
- Learnt about effectively communicating with people who are differently abled.

Ask

- If they can, why can't you?
- Discuss concepts related to 'Creativity and Innovation' with the participants as given in the Participant Handbook.

Say

- Recall the stories on motivation.
- What is the inner drive that motivates people to succeed?
- Let's learn more about such creative and innovative entrepreneurs with the help of an activity.

Team Activity

- This is a group activity.
- Think of any one famous entrepreneur and write a few lines about him or her.

Activity De-brief

- Why did you choose this particular entrepreneur?
- What is his/her brand name?
- What creativity does he/she possess?
- What was innovative about their ideas?

Do

- Conduct a doubt clarification session if needed.
- Encourage the non-participating trainees to open up and speak

Summarize

- Summarize the unit by asking participants if they know of some people who are highly creative and innovative in their approach.
- Ask them to share some experiences about these people with the class.

Notes for Facilitation

- Source for stories on innovations:

http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-Indians/20151208.htm

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Council

13. Annexures

Annexure I : Training Delivery Plan

Annexure II : Assessment Criteria

nnexure III: List of R Codes Used in PHB

Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Grass Root Telecom Provider		
Qualification Pack Name & Ref. ID	Grass Root Telecom Provider **TEL/Q6207**		
Version No.	2.0	**Version Update Date**	27 /01/2022
Pre-requisites to Training (if any)	12th Class OR 10th Class + I.T.I OR Diploma (Science/Electronics/Telecom/IT and other relevant fields)		
Training Outcomes	**By the end of this program, the participants will be able to:** • Maintain site security and hygiene • Perform preventive maintenance of Optical Network (ONT) Components • Promote use of devices and provide services • Organize work and resources as per Health and Safety standards • Interact effectively with team members and customers		

Sl. No.	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration(Hours)
1	Role and Responsibilities of a Grass Root Telecom Provider	Role and Responsibilities of a Grass Root Telecom Provider	• Explain the role and responsibilities of grass root telecom provider • Describe the size and scope of the Telecom industry and its various sub-sectors • Discuss the various opportunities for a grass root telecom provider in the Telecom industry • Recognize the organisational policies on incentives, delivery standards, personnel management and public relations (PR) pertinent to the job role • Identify the documentation involved in the different processes of maintaining Optical Network Terminal (ONT) sites • Identify the standard checklists and schedules recommended by the operating companies (OPCOs) • Appreciate and follow the safety, health and environmental policies and regulations for the workplace as well as for telecom sites in general	Bridge Module	Classroom Lecture/Powerpoint Presentation /Question & Answer / Group Discussion	Laptop with software like MS Office and Internet, Whiteboard Marker, Projector	8 (Theory - 8:00)
2	Maintain site hygiene and implement Security	Overview of Computer Networks ,IP Addressing, Configuring Network	• use fire extinguisher to control fire in case of accident •record activities undertaken for fault in the given format •record repairs/replacements undertaken during fault rectification	TEL/N6226 PC9,PC10, PC11,KU7,KU8	Classroom Lecture/Powerpoint Presentation /Question & Answer / Group Discussion	Laptop with software like MS Office and Internet, Whiteboard Marker, Projector. Product Manuals, Charge Controller Unit (CCU), Solar Photo Voltaic System (SPV), Telephone Junction Box (TJB), battery bank and fire extinguisher Laptop with site maintenance software	33.3(Theory - 16 Practical - 24)
		Optical Line Terminal (OLT) / Network Operation Center (NOC) – issues or up-gradation of Technology	•perform all functions and take responsibility as a custodian of an Optical Network Terminal(ONT) site •interact with Optical Line Terminal(OLT)/Network Operation Center(NOC) supervisors regarding encountered issues or upgradation of technology •coordinate with Gram Panchayat officials to ensure smooth day-to-day operations •SOP for ONT (Optical Network Terminal) site hygiene maintenance	TEL/N6226 PC1,PC2, PC3,KU1,KU3			33.3(Theory - 16 Practical - 24)
		Equipment used at site	•verify that the various components/equipment such as of Charge Controller Unit(CCU), Solar Photo Voltaic System(SPV), Telephone Junction Box(TJB) and battery bank are working as per specifications •maintain hygiene of Charge Controller Unit(CCU), Solar Photo Voltaic(SPV) System, Telephone Junction Box(TJB) and battery bank as per standards •check all the cable connecters for appropriate tightness and any damage •perform necessary steps for the repair/replacement of damaged cables if required •report to supervisor in case the fault cannot be rectified	TEL/N6226 PC3,PC4, PC5,PC6,PC7 ,PC8,KU5			33.3(Theory - 16 Practical - 24)
3	Perform Preventive Maintenance	Fibre Optics Overview, Light in fibre, Transmission and Optical Sources, GPON,GPS	•read preventive maintenance guidelines of Charge Controller Unit (CCU), Solar Photo Voltaic (SPV) System, Telephone Junction Box (TJB) and battery bank •implement preventive maintenance of CCU, SPV, TJB and battery bank as per given schedule •ensure availability of required equipment and assets •fill-in preventive maintenance report form in the specified format	TEL/N6227 PC1,PC2, PC3,PC4,KU1, KU3,KU5	Classroom Lecture/Powerpoint Presentation /Question & Answer / Group	Laptop with software like MS Office and Internet, Whiteboard Marker, Projector, Complete range of accessories, equipment repairing tool kit, Product Manuals,	30 (Theory - 15 Practical - 15)
		PON Maintenance &ONT - CCU Indicators	•observe CCU panel and interpret alarm •verify premature ageing of battery bank cells and SPV panels and replace if necessary •examine the patch cord and pigtails and replace if found damaged •report to OLT/NOC supervisor in case of any issues with equipment	TEL/N6227 PC5,PC6, PC7,PC8, KU6, KU7,KU8			35 (Theory - 16 Practical - 19)

		ONT Status Check, Preventive maintenance, troubleshoot, record repairs / replacements	•importance of Optical Network Terminal (ONT) remaining operational at all times. •troubleshooting procedure for Optical Network Terminal (ONT)	TEL/N6227 KU2, KU5	Discussion	Charge Controller Unit (CCU), Solar Photo Voltaic System (SPV), Telephone Junction Box (TJB),	35 (Theory - 16 Practical - 19)
4	Promote usage of telecom devices and provide services	Approach to Common Service Centers	•propose/pitch range of products/services to local population to make them aware about types of local devices (smartphone, tablets and e-terminals) available •acquaint local population about usage and necessity of local devices (smartphone, tablets and e-terminals) •explain about the wide range of features available in smartphone, tablets and e-terminals	TEL/N6228 PC1,PC2,PC3	Classroom Lecture/Powerpoint Presentation /Question & Answer / Group Discussion	Complete range of accessories, equipment repairing tool kit, Product Manuals, Charge Controller Unit (CCU), Solar Photo Voltaic System (SPV), Telephone Junction Box (TJB), battery bank Laptop with MS Office	21 (Theory - 9 Practical - 12)
		Digital Devices & Digital Approaches	•install necessary equipment such as modem using routers, UPS, cables to make the devices functional at a particular location •configure smartphone, tablets and e-terminals •demonstrate how to operate the device to the concerned people for ease of use •perform basic trouble shooting of devices in case of any problems/error	TEL/N6228 PC4,PC5,PC6,PC7			21 (Theory - 9 Practical - 12)
		Monitoring & Maintenance of Electrical Systems	•functionality of laptop, smartphones, tablets and e-terminals •steps to be followed for different procedures and instructions •hardware and software configuration •functionality of modem, routers, UPS, cables	TEL/N6228 KU4,KU5,KU6,KU7			21 (Theory - 9 Practical - 12)
		Revenue Management and record maintenance	•distribute bills and collect revenue from users •maintain the record of rent agreement and electricity bill for ONT site •remind the superior for timely payment of rent and electricity bill for the site	TEL/N6228 PC8,PC9,PC10			21 (Theory - 9 Practical - 12)
12	Organise resources and work effectively and safely	Perform work as per quality standards	•Employ appropriate ways to keep the workspace clean and tidy •Discuss how to perform individual roles and responsibilities as per the job role while taking accountability for the work •Show how to record/document tasks completed as per the requirements within specific timelines •Perform the steps to implement schedules to ensure the timely completion of tasks •Identify the cause of a problem related to your own work and validate it •Apply appropriate techniques to analyse problems accurately and communicate different possible solutions to the problem	TEL/N9101 PC1, PC2, PC3, PC4, PC5, PC6			6 T(2:00) P(4:00)

13		Maintain a safe, healthy and secure working environment (Part - 1)	•Discuss how to comply with the organisation's current health, safety, security policies and procedures •Demonstrate the steps to check for water spills in and around the workspace and escalate these to the appropriate authority •Practice reporting any identified breaches in health, safety, and security policies and procedures to the designated person •Use safety materials such as goggles, gloves, earplugs, caps, ESD pins, covers, shoes, etc. •Apply required precautions to avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence •Identify hazards such as illness, accidents, fires or any other natural calamity safely, as per the organisation's emergency procedures, within the limits of the individual's authority •Explain the importance of regularly participating in fire drills or other safety-related workshops organised by the company •Discuss the significance of reporting any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected	TEL/N9101 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Whiteboard /blackboard marker /chalk, Duster, Computer or Laptop attached to LCD projector, Personal Protection Equipment: Safety glasses, Head protection, Rubber gloves, Safety footwear, Warning signs and tapes, Fire extinguisher and First aid kit	6 T(2:00) P(4:00)
14		Maintain a safe, healthy and secure working environment (Part - 2)	•Explain how to maintain appropriate posture while sitting/standing for long hours •Employ appropriate techniques to handle heavy and hazardous materials with care while maintaining an appropriate posture •Discuss the importance of sanitising workstations and equipment regularly •Discuss how to avoid contact with anyone suffering from communicable diseases and take necessary precautions •Show how to clean hands with soap and alcohol-based sanitiser regularly •List the safety precautions to be taken while travelling, e.g., maintain a 1m distance from others, sanitise hands regularly, wear masks, etc. •Role-play a situation to report hygiene and sanitation issues to the appropriate authority •Discuss how to follow recommended personal hygiene and sanitation practices, for example, washing/sanitising hands, covering the face with a bent elbow while coughing/sneezing, using PPE, etc.	TEL/N9101 PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC22			6 T(2:00) P(4:00)
15		Conserve material / energy / electricity	•Apply appropriate ways to optimise the usage of material, including water, in various tasks/activities/processes •Use resources such as water, electricity and others responsibly •Demonstrate the steps to carry out routine cleaning of tools, machines and equipment • Apply appropriate ways to optimise the use of electricity/energy in various tasks/activities/processes •Perform periodic checks of the functioning of the equipment/machine and rectify wherever required •Explain the significance of reporting malfunctioning and lapses in the maintenance of equipment •Use electrical equipment and appliances properly	TEL/N9101 PC23, PC24, PC25, PC26, PC27, PC28, PC29			6 T(2:00) P(4:00)
16		Use effective waste management / recycling practices	•Identify recyclable, non-recyclable and hazardous waste •Apply appropriate ways to deposit recyclable and reusable material at the identified location •Explain the process to dispose of non-recyclable and hazardous waste as per recommended processes	TEL/N9101 PC30, PC31, PC32			6 T(2:00) P(4:00)

17	Communication and interpersonal skills	Interact effectively with superiors	•Explain how to receive work requirements from superiors and customers and interpret them correctly •Role-play a situation to inform the supervisor and/or concerned person about any unforeseen disruptions or delays •Practice participating in decision-making by providing facts and figures, giving/accepting constructive suggestions •Practice rectifying errors as per feedback and ensure the errors are not repeated	TEL/N9102 PC1, PC2, PC3, PC4	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Whiteboard and Markers, Chart paper and sketch pens, LCD Projector and Laptop for presentations, Sample of escalation matrix, organisation structure	6 T(2:00) P(4:00)
18		Interact effectively with colleagues and customers (Part - 1)	•Discuss how to comply with the organisation's policies and procedures for working with team members •Apply appropriate modes of communication, such as face-to-face, telephonic and written, to communicate professionally •Show how to respond to queries and seek/provide clarifications if required	TEL/N9102 PC5, PC6, PC7			6 T(2:00) P(4:00)
19		Interact effectively with colleagues and customers (Part - 2)	•Illustrate the process to co-ordinate with the team to integrate work as per requirements •Discuss how to resolve conflicts within the team/with customers to achieve a smooth workflow •Discuss how to recognise emotions accurately in self and others to build good relationships •State how to prioritise team and organisation goals above personal goals	TEL/N9102 PC8, PC9, PC10, PC11			6 T(2:00) P(4:00)
20		Gender sensitisation	•Explain how to maintain a conducive environment for all genders in the workplace •Discuss ways to encourage appropriate behaviour and conduct with people across gender •Explain how to ensure equal participation of people across genders in discussions	TEL/N9102 PC12, PC13, PC16			6 T(2:00) P(4:00)
21		PwD sensitisation	•Identify ways to assist team members with a disability in overcoming any challenges faced at work •Practice appropriate verbal and non-verbal communication while interacting with People with Disability (PwD)	TEL/N9102 PC14, PC15			6 T(2:00) P(4:00)
Total Duration							**Thory Duration 180:00 Practical Duration 220:00**
On the job Training (Training provided by the relevant industry)							**100**
Employability Skills (DGT/VSQ/N0101) (https://eskillindia.org/NewEmployability)							**30**
Total Duration (Theory + Practical +OJT+ES)							**530**

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for Grass Root Telcom	
Job Role	**GRASS ROOT TELECOM PROVIDER**
Qualification Pack	**TEL/Q6207**
Sector Skill Council	**TSSC**

Sr. No.	Guidelines for Assessment
1	For assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criteria
5	To pass the Qualification Pack , every trainee should score a minimum of 50% in every NOS and overall 50% pass percentage in every QP
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessment Outcomes	Assessment Criteria for Outcomes	Marks Allocation		
		Theory	Skills Practical	Viva Marks
TEL/N6226: Maintain Site Security and Hygiene	*Coordinate activities for site security and hygiene*	**5**	**15**	**2**
	PC1. perform all functions and take responsibility as a custodian of an Optical Network Terminal(ONT) site	1	5	1
	PC2. interact with Optical Line Terminal(OLT)/Network Operation Center(NOC) supervisors regarding encountered issues or upgradation of technology	2	6	1
	PC3. coordinate with Gram Panchayat officials to ensure smooth day-to-day operations	2	4	0
	Monitor equipment and record keeping	**25**	**45**	**8**
	PC4. verify that the various components/equipment such as of Charge Controller Unit(CCU), Solar Photo Voltaic System(SPV), Telephone Junction Box(TJB) and battery bank are working as per specifications	3	6	1
	PC5. maintain hygiene of Charge Controller Unit(CCU), Solar Photo Voltaic(SPV) System, Telephone Junction Box(TJB) and battery bank as per standards	3	6	1
	Manitain Site security M	2	5	1
	PC7. perform necessary steps for the repair/replacement of damaged cables if required	3	5	1
	PC8. report to supervisor in case the fault cannot be rectified	1	5	1
	PC9. use fire extinguisher to control fire in case of accident	5	6	1
	PC10. record activities undertaken for fault in the given format	5	6	1
	PC11. record repairs/replacements undertaken during fault rectification	3	6	1
	NOS Total	**30**	**60**	**10**
TEL/N6227: Perform Preventive Maintenance of Optical Network Terminal (ONT) Components	*Perform preventive maintenance and keep record*	**17**	**19**	**5**
	PC1. read preventive maintenance guidelines of Charge Controller Unit (CCU), Solar Photo Voltaic (SPV) System, Telephone Junction Box (TJB) and battery bank	6	7	2
	PC2. implement preventive maintenance of CCU, SPV, TJB and battery bank as per given schedule	6	7	2
	PC3. ensure availability of required equipment and assets	5	0	1
	PC4. fill-in preventive maintenance report form in the specified format	0	5	0
	Monitor equipment and report issues	**23**	**31**	**5**
	PC5. observe CCU panel and interpret alarm	6	8	0
	PC6. verify premature ageing of battery bank cells and SPV panels and replace if necessary	6	8	2
	PC7. examine the patch cord and pigtails and replace if found damaged	6	8	2
	PC8. report to OLT/NOC supervisor in case of any issues with equipment	5	7	1
	NOS Total	**40**	**50**	**10**
	Create awareness about devices and its usage	**11**	**15**	**3**
TEL/N6228: Promote use of Devices and Provide	**PC1.** propose/pitch range of products/services to local population to make them aware about types of local devices (smartphone, tablets and e-terminals) available	3	5	1
	PC2. acquaint local population about usage and necessity of local devices (smartphone, tablets and e-terminals)	3	5	1
	PC3. explain about the wide range of features available in smartphone, tablets and e-terminals	5	5	1
	Configure devices and perform basic troubleshooting	**19**	**22**	**4**
	PC4. install necessary equipment such as modem using routers, UPS, cables to make the devices functional at a particular location	5	5	1
	PC5. configure smartphone, tablets and e- terminals	5	5	1

Services	**PC6.** demonstrate how to operate the device to the concerned people for ease of use	5	5	1
	PC7. perform basic trouble shooting of devices in case of any problems/error	4	6	1
	Manage revenue collection and bill payment	**10**	**13**	**3**
	PC8. distribute bills and collect revenue from users	0	3	1
	PC9. maintain the record of rent agreement and electricity bill for ONT site	5	5	1
	PC10. remind the superior for timely payment of rent and electricity bill for the site	5	5	1
	NOS Total	**40**	**50**	**10**
TEL/N9101: Organise Work and Resources as per Health and Safety Standards	*Perform work as per quality standards*	**4**	**9**	**2**
	PC1. keep workspace clean and tidy	0	1	0
	PC2. perform individual role and responsibilities as per the job role while taking accountability for the work	1	1	1
	PC3. record/document tasks completed as per the requirements within specific timelines	0	1	1
	PC4. implement schedules to ensure timely completion of tasks	0	2	0
	PC5. identify the cause of a problem related to own work and validate it	2	2	0
	PC6. analyse problems accurately and communicate different possible solutions to the problem	1	2	0
	Maintain safe, healthy and secure working environment	**16**	**27**	**4**
	PC7. comply with organisation's current health, safety, security policies and procedures	1	1	0
	PC8. check for water spills in and around the work space and escalate these to the appropriate authority	1	2	1
	PC9. report any identified breaches in health, safety, and security policies and procedures to the designated person	1	2	1
	PC10. use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.	1	2	1
	PC11. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence	2	3	1
	PC12. identify hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority	2	1	0
	PC13. participate regularly in fire drills or other safety related workshops organised by the company	1	3	0
	PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected	1	3	0
	PC15. maintain appropriate posture while sitting/standing for long hours	1	1	0
	PC16. handle heavy and hazardous materials with care, while maintaining appropriate posture	1	1	0
	PC17. sanitize workstation and equipment regularly	1	2	0
	PC18. clean hands with soap, alcohol-based sanitizer regularly	0	1	1
	PC19. avoid contact with anyone suffering from communicable diseases and take necessary precautions	0	1	0
	PC20. take safety precautions while travelling e.g. maintain 1m distance from others, sanitize hands regularly, wear masks, etc.	1	2	0
	PC21. report hygiene and sanitation issues to appropriate authority	1	1	0
	PC22. follow recommended personal hygiene and sanitation practices, for example, washing/sanitizing hands, covering face with a bent elbow while coughing/sneezing, using PPE, etc.	1	1	0
	Conserve material/energy/electricity	**7**	**16**	**3**
	PC23. optimize usage of material including water in various tasks/activities/processes	1	2	0

	PC24. use resources such as water, electricity and others responsibly	1	2	1
	PC25. carry out routine cleaning of tools, machine and equipment	1	2	0
	PC26. optimize use of electricity/energy in various tasks/activities/processes	1	3	1
	PC27. perform periodic checks of the functioning of the equipment/machine and rectify wherever required	1	3	1
	PC28. report malfunctioning and lapses in maintenance of equipment	1	2	0
	PC29. use electrical equipment and appliances properly	1	2	0
	Use effective waste management/recycling practices	**3**	**8**	**1**
	PC30. identify recyclable, non-recyclable and hazardous waste	1	2	1
	PC31. deposit recyclable and reusable material at identified location	1	3	0
	PC32. dispose non-recyclable and hazardous waste as per recommended processes	1	3	0
	NOS Total	**30**	**60**	**10**
TEL/N9102: Interact Effectively with Team Members and Customers	*Interact effectively with superiors*	**7**	**15**	**2**
	PC1. receive work requirements from superiors and customers and interpret them correctly	1	2	0
	PC2. inform the supervisor and/or concerned person about any unforeseen disruptions or delays	2	4	1
	PC3. participate in decision making by providing facts and figures, giving/accepting constructive suggestions	2	5	1
	PC4. rectify errors as per feedback and ensure the errors are not repeated	2	4	0
	Interact effectively with colleagues and customers	**7**	**26**	**4**
	PC5. comply with organisation's policies and procedures for working with team members	1	2	0
	PC6. communicate professionally using appropriate mode of communication such as face-to-face, telephonic and written	2	4	1
	PC7. respond to queries and seek/provide clarifications if required	2	4	1
	PC8. co-ordinate with team to integrate work as per requirements	0	3	0
	PC9. resolve conflicts within the team/with customers to achieve smooth workflow	1	5	1
	PC10. recognize emotions accurately in self and others to build good relationships	1	4	0
	PC11. prioritize team and organization goals above personal goals	0	4	1
	Respect differences of gender and ability	**11**	**24**	**4**
	PC12. maintain a conducive environment for all the genders at the workplace	2	5	1
	PC13. encourage appropriate behavior and conduct with people across gender	2	5	1
	PC14. assist team members with disability in overcoming any challenges faced in work	3	4	1
	PC15. practice appropriate verbal and non-verbal communication while interacting with People with Disability (PwD)	2	4	1
	PC16. ensure equal participation of the people across genders in discussions	2	6	0
	NOS Total	**25**	**65**	**10**

Do

Explain each Guideline for Assessment in detail.

Explain the score that each trainee needs to obtain.

- Recapitulate each NOS one-by-one and take participants through the allocation of marks for Theory and Skills Practical.
- Explain the Allocation of Marks. Explain that they will be assessed on Theory and Skills Practical.
- Explain that for the first NOS, 34 marks are allotted for Theory and & 66 for Skills Practical.

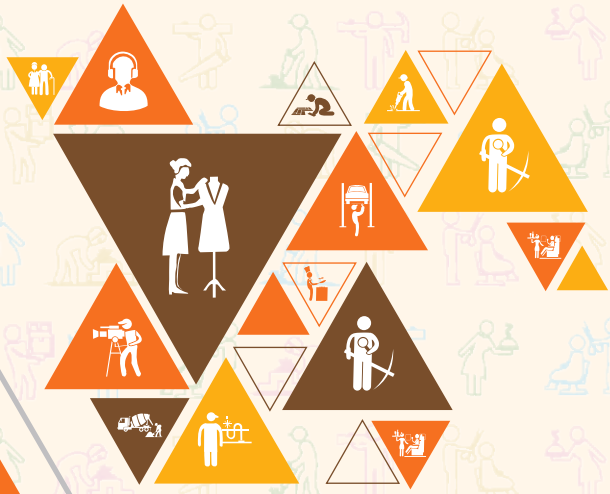
QR Codes used in PHB

Chapter No.	Unit No.	Topic Name	Page No. in PHB	QR Code
2	2.4	Optical Line Terminal and Power Summary	42	Click/Scan the QR code to access the related video
1	1.6	Electromagnetic Spectrum Application	22	Click/Scan the QR code to access the related video
3	3.4	Light Propagation Properties	82	Click/Scan the QR code to access the related video
3	3.4	FiberManufacturing	82	Click/Scan the QR code to access the related video
5	5.2	First Aid at workplace	225	Click/Scan the QR code to access the related video
5	5.3	Handwashing Techniques	234	Click/Scan the QR code to access the related video
5	5.3	CPR	241	Click/Scan the QR code to access the related video
5	5.5	E-Waste recycling and management	247	Click/Scan the QR code to access the related video

QR Codes used in PHB

Chapter No.	Unit No.	Topic Name	Page No. in PHB	QR Code
6	6.1	Types of Communication	258	Click/Scan the QR code to access the related video
6	6.1	Communication with customers and colleagues	261	Click/Scan the QR code to access the related video
6	6.1	Effective telephone communication	263	Click/Scan the QR code to access the related video
Employablity Skills				Click/Scan the QR code to access Employability Skills eBook

Notes



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