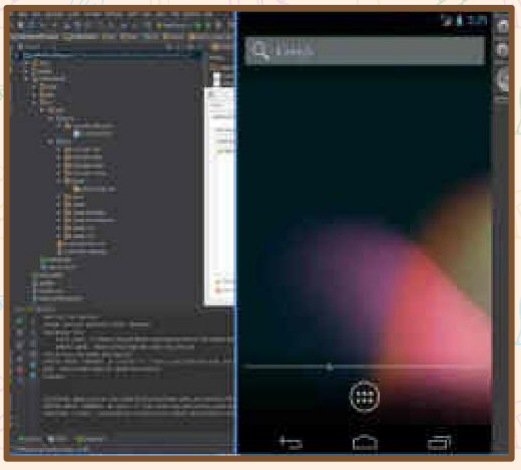
Telecom Sector Skill Council

Facilitator Guide



Sector
Telecom

Sub-Sector
Handset

Occupation
Terminal Equipment Application Developer

Reference ID: **TEL/Q2300,** Version **6.0**
NSQF Level **4**

Android Application Technician - Telecom Devices

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Telecom Sector Skill Council
Estel House,3rd Floor, Plot No: - 126, Sector-44
Gurgaon, Haryana 122003
Phone: 0124-2222222
Email: tssc@tsscindia.com
Website: www.tsscindia.com

"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

Telecom Sector Skill Council (TSSC) would like to thank all the individuals and institutions who contributed in various ways towards the preparation of this facilitator guide. The facilitator guide could not have been completed without their active contribution. Special gratitude is extended to those who collaborated during the preparation 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 their guidance that we have tried to bridge the existing skill gaps 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 endeavours.

About this Guide

The facilitator guide (FG) for Android Application Technician – Telecom Devices is primarily designed to facilitate skill development and training of people, who want to become professional Android Application Technicians in the industry. The Facilitator Guide is aligned to the Qualification Pack (QP) and the National Occupational Standards (NOS) as drafted by the Telecom Sector Skill Council of India (TSSCI) and ratified by National Skill Development Corporation (NSDC).

It includes the following National Occupational Standards (NOSs):

1. TEL/N2300: Assist in Configuring Android Development Environment and User Interface for Telecom Devices
2. TEL/N2301: Assist in Configuring Value Added Services (VAS) in Android Applications for Telecom Devices
3. TEL/N2302: Assist in Testing and Publishing Android Applications for Telecom Devices
4. TEL/N9110: Follow sustainability practices in the development of mobile applications
5. DGT/VSQ/N0101: Employability Skills (30 Hours)

Post this training, the participants will be able to perform tasks as professional Android Application Technician. We hope that this Facilitator Guide provides a sound learning support to our young friends to build a lucrative career in the telecom industry.

Symbols Used

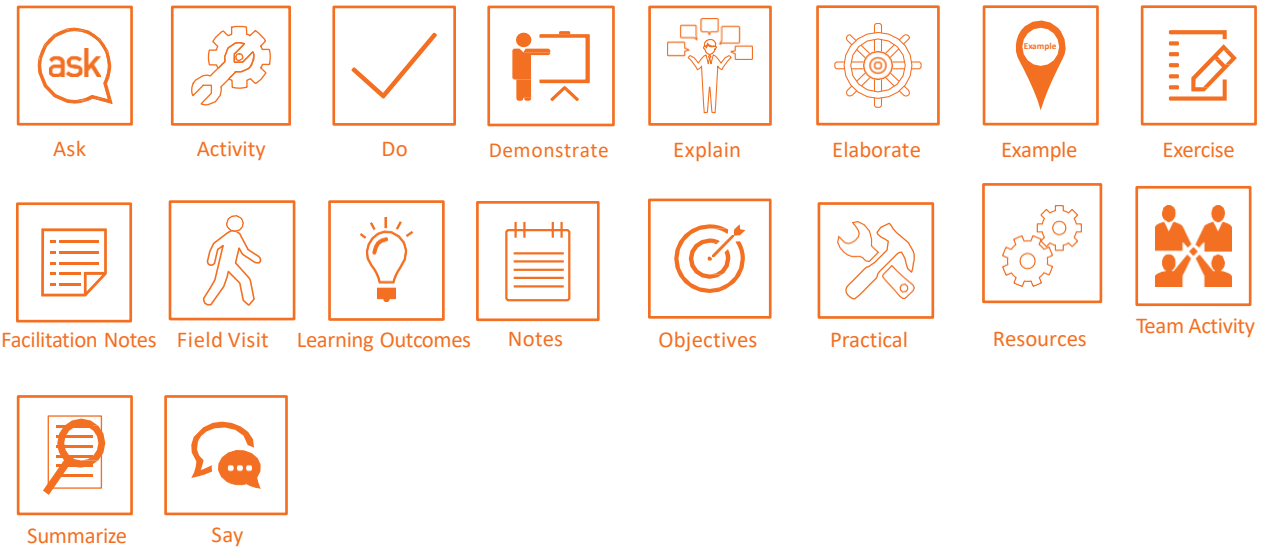


Table of Contents

It is recommended that all trainings include the appropriate Employability skills Module. Content for the same is available here: **https://www.skillindiadigital.gov.in/content/list**

1. Role and Responsibilities of an Android Application Technician – Telecom Devices

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Define and classify the means and types of communication systems.
2. Illustrate and explain the various propagation methods used in communication systems.
3. Differentiate and describe the role of networking and the Internet in communication systems.
4. List and apply the common access methods (protocols) for data flow in networks.
5. Describe and distinguish the key features of the different generations of advanced communication systems (e.g., 3G, 4G, 5G).
6. Compare and contrast the architecture and features of major Mobile Operating Systems and their versions (e.g., Android vs. iOS).
7. Identify and summarize the key features and evolution of the Windows Mobile operating system.
8. Identify and distinguish the key features across at least three successive versions of the Android OS.
9. List, justify, and execute the procedure for installing Android based on its hardware requirements on a smartphone.

UNIT 1.1: Introduction to the Program

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Define and describe the basic principles and working process of Telecommunication.
2. Differentiate and compare the architecture and key features of major Mobile Operating Systems.
3. Identify and distinguish the key features across at least three successive versions of the Android OS.
4. List and justify the minimum hardware and software requirements for Android installation.
5. Successfully install, configure, and verify the Android OS on a target device.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board..

1.1.1 Note

- The key learning outcomes and unit objectives have been mentioned at the beginning of the module. Make sure that these outcomes and objectives are shared with the participants at the beginning, and when the module gets over do a collective feedback to make sure all have been covered.
- This is the first session of the program. Introduce yourself, the program and its purpose in detail. Explain the background, the duration of the assessment and finally how the program will help them to get a job. Ensure that the participants understand how their entire month will be structured and how they will benefit from the course. Answer their questions satisfactorily.
- This is the first session of the program which introduces us to the program.

1.1.2 Say

Good morning and a very warm welcome to this training program ‘Android Application Technician - Telecom Devices’.

1.1.3 Do

Introduce yourself with your name and background and your role in the training program.

Give them a background of the training program. Talk about:

1. The total duration of the program
2. How the day will be divided
3. Periodic assessments
4. Final assessments
5. Your expectations from them about their conduct, laying ground rules

1.1.4 Say

Now that you have understood what the program is about let us get to know each other better.

1.1.5 Activity

Take a ball of wool and get the participants in a circle. You are also a part of the circle. Tell them here is a ball of wool, I am going to take a piece of the thread in my hand and throw the ball to anyone. So please be alert and do not let the ball fall. Whoever gets the ball, please introduce yourself (name, and one adjective that best describes you) hold a piece of the thread and throw it to anyone you want. Slowly a web of the wool will be created with everyone holding the thread..

Debrief

Ask them now that we know each other can you see what we have created. Wait for answers. Tell them, “We have created a web, a web of energy.” Ask everyone to loosen their hold on the thread and say, “See if we lose energy how the web loses energy and when we hold it tight the web is strong. Similarly as we do this program and study together, each is responsible for the learning and environment in the group. So be responsible, alert and engaged.”

Skill Practice	Time	Resources
Ice Breaker	1 hr	Small writing pads, pens, white board, marker and ball of wool

1.1.6 Say

Let us begin the session by discussing about the program.

1.1.7 Say

Terminal Equipment Application Development for Android is a platform where companies build the Android Operating System and its applications for the community.

1.1.8 Do

- Share with the participants about the aim of the training program.
- Share with them about the company that invented android and discuss how it has turned out to be the most used operating system till date.
- Explain them the job role of a Android Application Technician - Telecom Devices.

1.1.9 Elaborate

This program is aimed at training candidates for the job of a "Android Application Technician - Telecom Devices", in the "Telecom" Sector/ Industry.

Job Role of a Android Application Technician - Telecom Devices:

- Terminal Equipment Application Developer (Android) is responsible for creating applications for Android platform that can be used on smartphone and tablets running on Android Operating System.
- The developer handles end-to-end activities for application development ranging from installing requisite frameworks, setting-up of development environment, developing apps, security frameworks, testing and deployment.
- Must have good programming skills in Java, multithreading and operating system concepts.
- Must have problem solving & analytical skills and their translation to specified outcome.

1.1.10 Activity

Ask the participants to generate 10 to 15 words about whatever they have understood about the training program so far. Capture each response, as it comes in, on the whiteboard. You can use this opportunity to introduce essential terms, too.

Skill Practice	Time	Resources
Word Tree	2 hrs	Chalk/Marker, blackboard/Flipchart

1.1.11 Activity

Ask the participants to refer to the participant handbook and study in detail about responsibilities and attributes of a Android Application Technician - Telecom Devices, so that when they are asked questions regarding it they are able to answer.

Skill Practice	Time	Resources
Self Study	2 hrs	Chalk/Marker, blackboard/Flipchart

1.1.12 Say

Let us now discuss about the overview of the program and the basic skills which a Android Application Technician - Telecom Devices must possess.

1.1.13 Do

Share with the participants about the overview of the program and the basic skills which a Android Application Technician - Telecom Devices must possess.

1.1.14 Elaborate

This program will facilitate an overview of:

- Understanding the Android Application Development Framework
- Setting up Android Application Development Environment
- Creating Android Projects
- Creating adaptive and responsive user interface for various devices and form factors
- Deploying app to an emulator or device

The skills that this program trains you in are:

- Communication skills
- Liaisioning and coordination skills
- Reading and writing skills for technical literature related to mobile applications.
- Technical skills
- Task management skills
- Programming skills

1.1.15 Do

Tell the participants to get ready for an activity

1.1.16 Activity

Ask the participants to refer to the participant handbook and study in detail about overview of the program and the basic skills which a Android Application Technician - Telecom Devices must possess, so that when they are asked questions regarding it they are able to answer them.

Skill Practice	Time	Resources
Self study	2 hrs	Small writing pads, pens and Participant Handbook

1.1.17 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.1.18 Summary

1. Computers are the devices that are used for doing random arithmetic calculations automatically.
2. E-mails, documents, videos, songs, etc. can be easily transformed into signal with the help of a computer and then transferred through the internet to the other computer.
3. A telecommunication system comprises of three fundamental parts :-

- Transmitter
- Transmission medium
- Receiver

UNIT 1.2: History of Telecommunication

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Classify and describe the major types of communication systems (e.g., analog, digital, simplex, duplex
2. Illustrate and explain the core networking principles and data flow essential to the working of the Internet.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.2.1 Note

This is the second session of the program which talks about history of Telecommunication in India.

1.2.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.2.3 Do

1. Begin with revising the topics explained in the previous session. Ask the following questions
   - List down the job role of a Android Application Technician - Telecom Devices.
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.2.4 Say

Now let us begin with a new session which is about the history of telecommunication in India. In the previous sessions we have had a clear understanding about the objectives of the program, now we will talk about the history of telecommunication in India.

1.2.5 Say

Communication was thought to have started very early when civilizations were set up. The electric telegraph was invented in 1816 by English inventor Francis Ronalds' using static electricity. In 1876, telephone was invented by Alexander Bell and Alisha Gray. The invention of telephone gave birth to the invention of cell phones and mobile phones in the early 18th and 19th centuries.

1.2.6 Do

- Show them some pictures of telegraph, telephones, cell phones and modern day smart phones.
- Share with them about smart phone subscription in India.
- Discuss with them about different brands of smart phones.

1.2.7 Elaborate

Refer to participant handbook (Pg-4-7) to explain about history of telecommunication in India in detail.

1.2.8 Do

Tell the participants to get ready for an activity

1.2.9 Activity

Ask the participants to refer to the participant handbook and study in detail about the history of communication, so that when they are asked questions regarding it they are able to answer them.

Skill Practice	Time	Resources
Self-study	2 hrs	Small writing pads, pens and Participant Handbook

1.2.10 Activity

Running the activity:

1. While showing the animations, make them understand what they are watching.
2. Ask them if they want to ask anything out of curiosity.

Skill Practice	Time	Resources
Audio/Visual Program	1 hr	Computer, slide show projector

1.2.11 Say

Let us now discuss about computers and internet.

1.2.12 Do

- Share knowledge with the participants about how computers help in setting up the internet.
- Discuss with the participants about how the internet works.
- Share with the participants about the terms like transmitter, receiver and the transmission medium.

1.2.13 Elaborate

- Internet being a wireless data communication medium works because of the hardware like modem.
- Optical fibres help in transmission of the data throughout the world wirelessly.

Refer to the participant handbook (Pg-5-6) to explain in detail about computer and internet.

1.2.14 Activity

Ask the participants to get into groups and discuss and explain to each other, diagrammatically about the working of the internet and the role hardware device plays in the transmission.

Skill Practice	Time	Resources
Group Discussion	2 hrs	Small writing pads, pens and participant handbook

1.2.15 Say

Let us conclude the session by revisiting what we have learnt so far.

1.2.16 Say

As we all went through different fundamentals that make up the basics of telecommunication, we understood how the signals move wirelessly and how the data can be transferred world wide.

1.2.17 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

UNIT 1.3: Signals

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Understand the basics of signals in telecom

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.3.1 Note

This is the third session of the program which talks about signals.

1.3.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.3.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What are the different modes of communication?
   - What is a transmitter, a receiver and the transmission medium?
   - What is internet?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.3.4 Say

Now let us begin with a new session which is about Signals. In the earlier sections, we learnt about history and basics of Telecommunication; we will now see what are signals.

1.3.5 Say

A signal is a medium which helps in the transmission of data from one point to another point. Without a signal wireless electronic devices don't work. Signals are classified into two categories:

1. Analog Signal
2. Digital Signal.

1.3.6 Do

Share with the participants different diagrams of the signals.

1.3.7 Activity

Running the activity

1. While showing them the videos, make them understand what they are watching.
2. Ask them if they want to ask anything out of curiosity.

Skill Practice	Time	Resources
Audio/Visual Program	1 hr	Videos/ slides on different types of signals, projector and a computer.

1.3.8 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.3.9 Summary

1. Signals play a very important role in a telecommunication system since they carry the information.
2. An analog signal can be defined as the signal which changes with respect to the information.
3. A digital signal is that type of signal which carries information in binary form (in combinations of 0s and 1s).

UNIT 1.4: Networks

Unit Objectives

After the completion of this unit, the participant will be able to:

- Define and describe the fundamental concepts and components of networking.
- Describe and distinguish the key features of the major generations of communication networks (e.g., 2G, 3G, 4G, 5G).

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.4.1 Note

This is the fourth session of the program which talks about networks.

1.4.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.4.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
    - What are the different types of signals?
    - What is a transmission medium?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.4.4 Say

Now let us begin with a new session which is about learning the networking fundamentals. We have already gone through signals and internet. Now we will learn what connects information across the world.

1.4.5 Say

Now let us understand about Networks.

1.4.6 Say

A mutual working of transmitters and receivers over large distances is termed as a network. To transmit information from one place to another in a digital communication system, a controlling unit called a router/modem is used.

1.4.7 Do

Share with the participants about different generations of networking.

1.4.8 Elaborate

The different generations of mobile networking are:

- GSM 2nd Generation
- UMTS 3rd Generation
- HSPA 3rd Generation
- LTE 4th Generation

Refer to the participant handbook (Pg-8-9) to explain in detail about various mobile operating systems.

1.4.9 Activity

Divide the participants in four groups and make them play a quiz on networking and different generations of networking. At the end of the activity repeat what has learnt so far.

Skill Practice	Time	Resources
Quiz	2 hrs	Participant Handbook

1.4.10 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.4.11 Summary

1. The mutual working of transmitters and receivers over large distances is termed as telecommunication networks.
2. To transmit information from one place to another in a digital communication system, a controlling unit called a router is used.
3. The mobile phone services started with the zero generation (0G) services which only supported few calls. Further advancements brought 1G, 2G, 3G and 4G services respectively.
4. Basic components of mobile phone:
    - Battery
    - Input
    - SIM Card
    - Memory Card
5. 3GPP is a collaboration between the organisational partners who belong to Asia, Europe and North America.
6. Generations of mobile communication that come under 3GPP:
    - GSM (2nd Generation)
    - UMTS (3rd Generation)
    - HSPA
    - LTE (4th Generation)

UNIT 1.5: Channel Access Methods

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the concept and principles of multiplexing.
2. Describe the fundamentals of Code Division Multiple Access (CDMA) systems.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.5.1 Note

This is the fifth session of the program which talks about various methods involved in channel access.

1.5.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.5.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What are the different generations of networking?
   - What do you understand by CDMA, UMTS, GSM and LTE?
   - Who are the different modes of communications?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.5.4 Say

Now let us begin with a new session which is about learning channel access methods and how we connect multiple systems to a single system for transmission of data.

1.5.5 Say

Now let us understand about multiplexers and de-multiplexers.

1.5.6 Say

Multiplexing is a method by which multiple signals are converted into one signal over a shared medium. The device that helps in multiplexing is called as a multiplexer or MUX and the device that helps in Demultiplexing is called as a de-multiplexer or DEMUX.

Demultiplex (DEMUX) is the reverse of the multiplex (MUX) process – it combines multiple unrelated analog or digital signal streams into one signal over a single shared medium.

1.5.7 Do

Share with the participants about CDMA

1.5.8 Elaborate

CDMA is an abbreviation for code Division Multiple Access which is one of the fundamental channel access schemes. It has a wider radio spectrum and is used in 3rd generation mobile phone systems.

Refer to the participant handbook (Pg-10-11) to explain in detail about channel access methods.

1.5.9 Activity

Divide the participants in four groups and make them map out the important points regarding multiplexers and de-multiplexers.

At the end of the activity, reiterate about the use of channel access methods in networking and communication.

Skill Practice	Time	Resources
Board activity	1 hr	Participant Handbook

1.5.10 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.5.11 Summary

1. Multiplexing is a method by which multiple signals are converted into one signal over a shared medium
2. In a multiplexed signal the communication channel is divided into many logical channels.
3. The device which helps in the multiplexing is called a Multiplexer or MUX

UNIT 1.6: Mobile Operating Systems

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Discuss the features and types of mobile operating systems.
2. Explain the fundamentals of Android application development.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.6.1 Note

This is the sixth session of the program which talks about mobile operating systems.

1.6.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.6.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What are the different generations of networking?
   - Define CDMA, UMTS, GSM and LTE.
   - What are the different modes of communications?
   - What are channel access methods?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.6.4 Say

Now let us begin with a new session which is about learning different mobile operating systems. In the previous sessions we have had a clear understanding about the hardware and networking fundamentals, now we will talk about different operating systems.

1.6.5 Say

Now let us understand about different mobile operating systems.

1.6.6 Say

A mobile operating system is an operating system for smart phones, tablets and other mobile devices. It combines features of a computer operating system with other features useful for mobile or handheld use like camera, music player etc.

1.6.7 Do

Share with the participants about Symbian OS.

1.6.8 Elaborate

Symbian is a mobile operating system which is designed for smartphones. It has been used by several major brands like Nokia, Samsung, Motorola and Sony Ericsson worldwide. Symbian OS is written in C++ language which is mainly done with the help of a software development kit (SDK). The Symbian UI variants/platforms are as following:

- S60
- S80
- S90
- UIQ
- MOAP (Mobile oriented applications Platform) Japan only
- OPP (Successor of MOAP)

Refer to the participant handbook (Pg-16-19) to explain about Symbian OS in detail.

1.6.9 Activity

Show the participants different versions of Symbian OS and the UI associated with it in different handsets.

At the end of the activity, reiterate what has been taught.

Skill Practice	Time	Resources
Audio/Visual Program	1 hr	Slides/videos

1.6.10 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.6.11 Summary

1. User interface is a virtual space where interactions between a human and machine take place. This interaction helps the human users to operate the machine really effectively.
2. Qt is a framework which is used for the development of applications of the operating system with the graphical user interface
3. The Symbian operating system is written in C++. Since C++ is also used in creating software in computers, therefore, C++ is used along with the Symbian standards to write the operating system
4. Eclipse is an integrated development environment which is used for programming computers. Mostly written in JAVA, Eclipse can also write programs in other computer languages which include C++, COBOL, D, C, Fortran etc.
5. The layers in which Symbian is written are:
    - User Interface Layer
    - Application Services Layer
    - . Java ME
6. Operating System Services and Layer Generic operating system services
    - Communication services
    - Multimedia and Graphics Services
    - Connectivity Services
7. Base Services Layer
8. Kernel Services and Hardware Interface Layer

UNIT 1.7: Windows Mobile

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Discuss the history and eventual discontinuation of the Windows Mobile platform.
2. Explain the key features and evolution of the BlackBerry OS and its hardware innovations.
3. Discuss the significance of the Mobile Information Device Profile (MIDP) in early mobile application development.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.7.1 Note

This is the seventh session of the program which talks about windows mobile.

1.7.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.7.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What is a User Interface UI?
   - What are the different versions of Symbian OS?
   - Which are the platforms where Symbian OS is written?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.7.4 Say

Now let us begin with a new session which is about other kinds of mobile operating system, Windows Mobile and BlackBerry OS.

1.7.5 Say

Now let us understand about Windows Mobile.

1.7.6 Say

Windows Mobile is a family of mobile operating systems which was developed by Microsoft for smart phones and pocket computers. Some of the standard features in the windows phone are multitasking, navigation etc.

1.7.7 Do

Share with the participants about Virtual Private Networking and Point-to-Point Tunnelling Protocol.

1.7.8 Elaborate

VPN is a private network which is made by the computer itself so that other computers can be connected to it via internet. Whereas, PTPP (Point-to-Point Tunnelling Protocol) is a method by which VPNs (Virtual Private Networking) are implemented.

Refer to the participant handbook (Pg-20-21) to explain in detail about Windows Mobile.

1.7.9 Say

Now let us understand about BlackBerry OS.

1.7.10 Say

BlackBerry OS is a mobile operating system which was developed by BlackBerry Ltd for the smart phones. The features that BlackBerry supports are synchronizing data with applications like Microsoft Exchange, tasks, calendar etc.

1.7.11 Do

Share with the participants about Mobile Information Device Profile (MIDP).

1.7.12 Elaborate

MIDP stands for Mobile Information Device Profile. It is a mobile specification which is published for using Java on mobile phones.

Refer to the participant handbook (Pg-21-22) to explain in detail about BlackBerry OS

1.7.13 Activity

Show the participants different videos on windows mobile handsets and blackberry OS handsets and the functions they carry.

At the end of the activity, reiterate about what has been taught

Skill Practice	Time	Resources
Audio/ Video Program	2 hrs	Slides/Videos

1.7.14 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.7.15 Summary

1. Windows mobile comes with some basic installed applications:
   - Internet Explorer Mobile (Default Browser)
   - Windows Media Player
   - Microsoft Office
2. Virtual Private Networking is a private network which is made by a computer itself so that other computers can be connected to it via internet.
3. The Point-to-Point Tunneling Protocol is a method by which virtual private networks (VPNs) are implemented.
4. MIDP stands for Mobile Information Device Profile. It is a mobile specification which is published for using Java on mobile phones and personal digital assistants (hand held personal computer).

UNIT 1.8: Android OS

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Analyze and differentiate the features, architecture, and historical context of major Android versions.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.8.1 Note

This is the eighth session of the program which talks about Android OS (Operating System).

1.8.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.8.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
    - What do you understand by terms like VPN, PTPP and MIDP?
    - What are the handsets that use Windows OS and BlackBerry OS?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.8.4 Say

Now let us begin with a new session which is about learning Android OS.

1.8.5 Say

Now let us understand about Android OS.

1.8.6 Do

Share with the participants about different android Features.

1.8.7 Elaborate

With Android you can view the Weather details, play games and even switch on and off different functions like Wi-Fi, mobile Bluetooth and mobile network etc.

Refer to the participant handbook (Pg-23-25) to explain about various Android Features.

1.8.8 Activity

Show the students different Android features like UI and games and how we can view a weather report by simply tapping on a button.

At the end of the activity, reiterate about what has been taught.

Skill Practice	Time	Resources
Audio/ Video Program	6 hrs	An Android Phone or a computer installed with an Android Emulator like Blue stacks

1.8.9 Do

Share with the participants about source code.

1.8.10 Elaborate

A source code can be defined as that programming language which is written in a readable computer language in the form of text.

Refer to the participant handbook (Pg-23) to explain the participants about source code.

1.8.11 Activity

Type a simple "Hello, World" program in C language and show them the output so that they can better understand how the source code works.

At the end of the activity, reiterate about what has been taught.

Skill Practice	Time	Resources
Audio/ Video Program	6 hrs	Computer installed with C language

1.8.12 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.8.13 Summary

1. Android is a Linux based operating system which is developed by Google. This operating system is designed for touchscreen smart-phones and tablets.
2. Source code can be defined as that programming language which is written in a readable computer language in the form of text.
3. ARM stands for Acorn RISC (Reduced instruction set computing) Machine.
4. Different versions are:
    - Froyo, Android (2.2 - 2.2.3)
    - Gingerbread, Android (2.3 - 2.3.7)
    - Ice Cream Sandwich, Android (4.0 – 4.0.4)
    - Jelly Bean, Android (4.1 – 4.3.1)
    - KitKat, Android (4.4 – 4.4.4)
    - Lollipop, Android (5.0 – 5.1.1)

UNIT 1.9: Basic Requirements for Installing Android on the Device

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the architecture and components of the Android operating system.
2. Describe the basic configuration and setup of Android handsets.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.9.1 Note

This is the ninth session of the program which talks about basic requirements for installing Android on the device.

1.9.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.9.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What are the different versions of Android?
   - What are the different features of an Android device?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.9.4 Say

Now let us begin with a new session which is about learning the basic requirements of installing Android.

1.9.5 Say

Now let us understand about the basic requirements.

1.9.6 Say

The basic requirements to install Android on a device are the configurations of the following hardware:

- Chipset
- Memory
- Storage
- Primary Display
- Navigation Keys
- Camera
- Bluetooth
- USB

The details of the hardware requirements and system requirements can be read in detail in the participant handbook (Pg-35-39).

1.9.7 Activity

Ask the participants to study in detail about the hardware and system configurations for installing Android on a device by referring to participant handbook, so that when they asked questions related to it, they are able to answer it.

Skill Practice	Time	Resources
Self-Study	2 hrs	Participant Handbook

1.9.8 Activity

Divide the participants in a group of 4 and make them play a quiz based on installation of android (including system requirements). At the end of the activity, reiterate about what has been discussed.

Skill Practice	Time	Resources
Quiz	2 hrs	Participant Handbook

1.9.9 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

1.9.10 Summary

1. A chipset is defined as the type of hardware which holds a collection of circuits which are required to work as one unit in order to perform a task with the system.
2. The minimum memory requirements for installing Android on the device should be 128 MB RAM (Random Access Memory) and 256 MB external flash memory or the storage memory.
3. Bluetooth is wireless technology developed for data transfer under personal area networks from one device to another.
4. USB is a way of data transfer from a personal computer to an android device and vice-versa.

UNIT 1.10: Android Installation

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Set up the required Java Development Kit (JDK) environment.
2. Successfully install and configure Android Studio on Windows, Linux, and macOS.
3. Use the SDK Manager to download and manage the essential Android SDK packages and tools.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

1.10.1 Note

This is the tenth session of the program which talks about Android Installation.

1.10.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

1.10.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What are the hardware requirements for installing Android?
   - What are the basic system requirements for installing Android?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

1.10.4 Say

Now let us begin with a new session which is about learning to install Android on the computer.

1.10.5 Activity

Ask the participants to divide themselves into four groups and perform android installation.

At the end of the activity go around and check whether each group has installed it or not.

Skill Practice	Time	Resources
Installation practice	7 hrs	Computer

1.10.6 Elaborate

Refer the Participant Handbook (pages- 40-52) for steps regarding the installation of Java Development kit and Android Studio. Follow the links and show the participants how to follow the links and install Android on the computer.

1.10.7 Activity

Ask the participants to divide themselves into four groups and perform android installation.

At the end of the activity go around and check whether each group has installed it or not.

Skill Practice	Time	Resources
Installation practice	7 hrs	Computer

1.10.8 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

Exercise

Answers to exercises for PHB

A. Multiple Choice Answers

1. c) Electromagnetic waves
2. b) Multiplexer
3. b) 1876
4. c) Analog signals are continuous; digital signals are discrete.
5. c) 3G
6. c) Spreading code
7. a) Manage hardware and software resources
8. c) C++
9. b) Linux
10. b) Android Studio

B. Fill in the Blanks:

1. Information / data
2. Demultiplexing
3. Packets
4. Repeater (or Amplifier)
5. 3GPP
6. Spreading code
7. Android and iOS
8. .apk
9. ARM
10. Android SDK

C. Short Answer Questions:

1. Telecommunication is the transmission of information over long distances using electronic means; main media: wired and wireless.
2. Analog: continuous signal (voice); Digital: discrete signal (binary data).
3. Transmitter sends signals, medium carries them, receiver receives and interprets them.
4. Multiplexing is combining multiple signals into one; device used is a multiplexer.
5. CDMA assigns each user a unique spreading code to share the same channel.
6. 2G – Digital voice, 3G – Internet data, 4G – High-speed broadband.
7. Controls hardware, runs applications, and manages system resources.
8. Limited app ecosystem and slow adaptation to touchscreen smartphones.

D. Application-Based Questions:

1. Repeater, because it regenerates and strengthens weak signals.
2. By using the unique spreading **code** assigned to each user.
3. Upgrade to SSD storage and increase RAM to 16 GB.
4. Open-source Android allows manufacturers to customize devices, increasing variety and innovation.

Notes

2. Setting up Android framework/ Development Environment and creating user interface

Telecom Sector Skill Council

Unit 2.1 – Creating a Simple Project

Unit 2.2 – Running the Project

Unit 2.3 – Creating and Running a Simple User Interface

TEL/N2300

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Describe the basic system flow and assist in simple coding tasks under supervision.
2. Identify the main ideas behind developing mobile applications.
3. Assist in creating and setting up an Android Virtual Device (AVD).
4. Demonstrate the basic use of emulators for running and checking applications.
5. Recognize and list the main components of an Android project.

UNIT 2.1: Creating Simple Android Project in Android Studio

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Follow guided steps to create a basic Android project using available tools.
2. Identify the key components of a Class definition and describe their basic functions.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

2.1.1 Note

This is the eleventh session of the program which talks about Android project.

2.1.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

2.1.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - What is Java Development kit?
   - What is Android Studio?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

2.1.4 Say

Now let us begin with a new session which is about learning to create a simple Android Project.

2.1.5 Elaborate

Refer to participant handbook to explain the participants about creating android projects.

2.1.6 Activity

First show the participants how a simple Android Project is written. Then compile it and show them the output. After that divide the participants into four groups and make them practice the same programs for them to get a better working understanding of the source code.

At the end of the activity, reiterate about what has been learnt.

Skill Practice	Time	Resources
Creating an Android Project	11 hrs	Computers

2.1.7 Notes for Facilitation

- Ask participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

UNIT 2.2: Running the Project in Android Studio

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Follow instructions to enable developer options on an Android device.
2. Demonstrate how to run an application using an Android Emulator under supervision.
3. Describe the basic procedure to install and run an application on a real Android device.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

2.2.1 Note

In this unit we will learn how to run the Android project on a real device. Before running we need to configure if the device is compatible with the computer.

2.2.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

2.2.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - How did we create the new android project
   - What is Android Studio?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

2.2.4 Say

Now let us begin with a new session which is about running the Android Project that we created in the previous session on various real devices

2.2.5 Elaborate

Refer to participant handbook to explain the participants about running the android projects on various devices and on various operating systems.

2.2.6 Activity

First show the participants how to compile and show the output of the project After that divide the participants into four groups and make them practice the same programs for them to get a better working understanding of the source code.

At the end of the activity, reiterate about what has been learnt.

Skill Practice	Time	Resources
Running Android Project	11 hrs	Computers

2.2.7 Notes for Facilitation

- Explain the steps for running the project on various devices. Help them to understand the steps
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

UNIT 2.3: Creating and Running a Simple User Interface

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Create and execute a basic user interface.
2. Follow the process of adding and configuring text fields.
3. Learn to add and implement button functionality.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

2.3.1 Note

In this unit we will learn how to create a simple user interface like adding a text field and a button and running it to see the output.

2.3.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session,

2.3.3 Do

1. Begin with revising the things explained in previous session. Ask the following questions
   - How did we run the android project
   - What are the various OS on which it can run?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

2.3.4 Say

Now let us begin with a new session which is about adding user interface to our project that is adding a text field and a button and running it to show the output

2.3.5 Elaborate

Refer to participant handbook to explain the steps for adding a textfield and a button and run it to show the output

2.3.6 Activity

First show the participants how to add a text field and a button in the project and run it.After that divide the class into four groups and make them work as a team for better understanding of the concept. At the end of the activity, reiterate about what has been learnt.

Skill Practice	Time	Resources
Addsimple user interface like text field and button to the Project and run it	11 hrs	Computers

2.3.7 Notes for Facilitation

- Explain the steps for adding simple user interface tools like textfield and button to the project and running it. Help them to note down the steps.
- clarify doubts of the participants if any
- Encourage other participants to answer it and to encourage peer learning in the class
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

Exercise

Answers to exercises for PHB

A. Multiple Choice Answers

1. b) Welcome Screen → New Project
2. b) Empty Activity
3. b) Kotlin and Java
4. b) Managing project builds and dependencies
5. a) Android Virtual Device
6. b) Tools → Device Manager
7. b) activity_main.xml
8. b) A TextView element
9. c) Canvas
10. b) Green Run Button

B. Fill in the Blanks:

1. activity_main.xml
2. MainActivity.kt and activity_main.xml
3. Gradle
4. Device Manager
5. ConstraintLayout
6. Component Tree
7. Kotlin
8. Package
9. AVD
10. text

C. Short Answer Questions:

1. It contains the main logic and controls the app's primary screen.
2. It defines the user interface layout of the main activity.
3. To ensure compatibility with a wider range of Android devices.
4. Open Device Manager → Create Virtual Device → Select hardware → Select system image → Finish setup.
5. By enabling USB debugging and connecting the phone via USB cable.
6. It downloads dependencies, compiles code, and builds the application.
7. It provides UI components like buttons, text fields, and images for design.
8. Drag a Button from the Palette to the layout and change the text attribute in the Attributes panel.
9. It displays the hierarchy of UI elements and helps organize the layout.
10. A screen displaying "Hello World!" text on the emulator or device.

Notes

3. Configuring Value Added Services (VAS) in Android Applications for Telecom Devices

Telecom Sector Skill Council

Unit 3.1 – Managing Data within Android Applications

Unit 3.2 – Messaging and Networking Service Integration on Android

Unit 3.3 – Fundamentals of Google Maps Integration and Location-Based Services

Unit 3.4 – Background Android Services

TEL/N2301

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the purpose of data storage options and assist in saving or retrieving data using SQLite or SharedPreferences.
2. Support integration of messaging services like SMS and Firebase Cloud Messaging (FCM).
3. Assist in establishing basic networking operations using HTTP or Retrofit.
4. Configure and test location-based services such as GPS and Google Maps API.
5. Identify and assist in implementing different Android service types — foreground, background, and bound.
6. Support execution of background tasks using WorkManager or JobScheduler.
7. Follow standard procedures for testing, debugging, and documenting value-added service configurations.

UNIT 3.1: Managing Data within Android Applications

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Demonstrate the ability to assist in storing, retrieving, and updating user data using various Android storage methods.
2. Apply basic SQL operations to manage and maintain structured data in predefined databases.
3. Support secure and efficient data handling across internal, external, and cloud storage environments.
4. Assist in enabling controlled data sharing between Android applications using content providers.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

3.1.1 Note

This is the twelfth session of the program which talks about basic layout, short messaging services and networking.

3.1.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

3.1.3 Do

1. Begin with revising the things explained in the previous session. Ask the following questions
   - What are emulators?
   - What is a layout?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

3.1.4 Say

Now let us begin with a new session which is about learning to create projects on User Interfaces, Short Messaging Service and networking Source codes.

3.1.5 Elaborate

Refer to participant handbook (Pg-76-115) to explain about creating projects on user interface, Short Messaging Service and networking Source codes.

3.1.6 Activity

First, create any one of the user interfaces to illustrate the participants. Then compile it and show them the output. After that divide the participants into four groups and make them practice other interfaces for them to get a better working understanding of the source code. Also, show them how to send an SMS using code and how the network can be set-up using code.

At the end of the activity, reiterate about what has been learnt.

Skill Practice	Time	Resources
Writing user interfaces, SMS and networking source codes	28 hrs	Computer

3.1.7 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

3.1.8 Summary

1. Linear layout is the simple and most basic layout. It is arranged in both horizontal direction and vertical direction. We will study the code for both the layouts and then run on the emulator to check the application.
2. Relative layout displays the child views in relative positions
3. Table layout is used to display child views in rows and columns. Image, text, button view can be shown in different child views through table layout.

UNIT 3.2: Messaging and Networking Service Integration on Android

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain how to integrate messaging services such as SMS and Firebase Cloud Messaging (FCM) into Android applications.
2. Demonstrate how to perform basic networking operations, including HTTP connections and RESTful API configuration.
3. Demonstrate the Bluetooth-based data exchange and device pairing.
4. Demonstrate techniques for managing data requests efficiently using synchronous, asynchronous, and caching methods.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

3.2.1 Note

This is the thirteenth session of the program which talks about data Storage

3.2.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

3.2.3 Do

1. Begin with revising the things explained in the previous session. Ask the following questions
   - Name different user interfaces.
   - What is an XML file and what is the role of activity file?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

3.2.4 Say

Now let us begin with a new session which is about learning about data Storage How the data can be stored in the internal memory, the external memory and how SQL helps in the data management in an Android device will be learnt in this session.

3.2.5 Elaborate

Explain the participants in detail about data storage techniques like internal storage and external storage, explain about the public and private files and difference between them.

3.2.6 Activity

Divide the class into four groups and ask them to create source code for data management

Skill Practice	Time	Resources
Writing source code for data management	22 hrs	Participant Handbook, Computer

3.2.7 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

3.2.8 Summary

1. A processor may be defined as an electrical circuit whose function is to perform operations on some external data source which may usually be a memory or some other data stream.
2. Types of processors:
   - Nvidia Tegra
   - Northbridge
   - Southbridge
3. Snapdragon is a product of Qualcomm which is nothing but a package of System on a Chip (SoC) semiconductor for mobile devices.
4. Two ways in which file can be saved:-

- Public Files- Public files are those files that stay on the device even if the user does any modification.
- Private Files- Private files are the files which are accessible for applications and they get deleted as soon as the application is removed.

UNIT 3.3 Fundamentals of Google Maps Integration and Location-Based Services

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Learn how to create and load databases
2. Learn to delete and update databases

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

3.3.1 Note

In this unit, the participants will learn how to create and load databases, and learn how to delete and update databases.

3.3.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

3.3.3 Do

1. Begin with revising the things explained in the previous session. Ask the following questions
   - what is a scroll view layout?
   - What is a layout?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

3.3.4 Say

Now let us begin with a new session which is about learning to create projects on User Interfaces, Short Messaging Service and networking Source codes.

3.3.5 Elaborate

Refer to participant handbook to explain the concepts of database. How to create a database, load the database,update a table and delete a table in SQLite

3.3.6 Activity

First, create a database and load it. work on update and delete database.

After that divide the participants into four groups and make them practice working with databases. At the end of the activity, reiterate about what has been learnt.

Skill Practice	Time	Resources
Writing user interfaces, SMS and networking source codes	28 hrs	Computer

3.3.7 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

3.3.8 Summary

1. Explain the databases are used for storing useful information for future retrieval.
2. For repeating or structured data, such as some contact information, it is ideal to save the data on a database. The APIs needed to access the database on Android are available in android.database.sqlite.package
3. Tables are created inside the database to store the required information.

UNIT 3.4: Background Android Services

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the types of Android services (foreground, background, bound) and their appropriate use cases.
2. Demonstrate the setup of background tasks using WorkManager or JobScheduler as per given instructions.
3. Describe standard procedures for handling recurring background tasks and monitoring their performance impact.
4. Demonstrate data sharing techniques between activities and background services.
5. Explain memory management and UI update practices using tools such as ViewModel and LiveData.

Resources to be Used

Participant handbook, laptop/desktop system, Android Studio, emulator or test device, internet connection, sample Android project files, whiteboard, flipchart, markers, projector.

3.3.1 Note

In this unit, we will focus on how Android applications handle background operations, manage data between services and activities, and maintain memory-efficient UI updates for better performance.

3.3.2 Say

In today's session, we will understand how Android apps perform tasks in the background, such as downloads, syncing, and notifications, without disturbing the user interface. You will also learn how to safely manage memory and update the app UI in a smooth and professional way.

3.3.3 Ask

Ask the participants the following questions:

- Have you noticed how apps continue working even when you minimize them?
- What happens when you download a file and switch to another app?
- Why do some apps become slow or crash when multiple apps are running?

Write their responses on the whiteboard and relate them to Android services and memory management.

3.3.4 Elaborate

- Introduction to Android Services
- Types of Android services
- Introduction to WorkManager and JobScheduler
- Differences between WorkManager and JobScheduler
- Setting up background tasks using WorkManager
- Memory management best practices

3.3.5 Say

Let us now move into a practical activity where you will create Android services and manage background tasks and UI updates.

3.3.6 Activity

Steps:

1. Divide the class into small groups.
2. Provide each group with a pre-built Android demo project.
3. Ask trainees to:
   - Create a Foreground Service for a background task (e.g., file download)
   - Create a Bound Service for data sharing
4. Next, guide them to:
   - Configure a WorkManager task for periodic execution
   - Set up JobScheduler for device-based job conditions
5. Then, ask them to:
   - Use ViewModel to store UI data
   - Use LiveData to observe and update UI automatically
6. Observe how UI remains stable even during background processing.

Skill Practice	Time	Resources
Android Background Services and UI Update Practice	60 minutes	Android Studio, laptop, emulator/test device, internet connection, sample Android project.

3.3.7 Notes for Facilitation

- Emphasize that improper use of background services can drain battery and memory.
- Reinforce the importance of using WorkManager for reliable background execution.
- Encourage clean architecture and separation of UI and background logic.
- Motivate trainees to ask doubts regarding Android lifecycle management.
- Ask trainees to complete the related coding exercise in the participant manual.

Exercise

Answers to exercises for PHB

A. Multiple Choice Answers

1. c) Service
2. b) SharedPreferences
3. b) SQL Queries
4. b) Sending push notifications
5. b) FusedLocationProviderClient

B. Fill in the Blanks:

1. Room
2. SharedPreferences
3. Cloudon
4. Start()
5. Reverse

C. Short Answer Questions:

1. It initializes the activity, sets up the UI, and prepares resources when the activity is first created.
2. Internal Storage is private to the app, while External Storage can be accessed by other apps and the user.
3. Compile-time SQL validation, less boilerplate code, and better integration with LiveData and ViewModel.
4. It combines data from GPS, Wi-Fi, and mobile networks to provide accurate location with lower battery consumption.
5. Create a Google Cloud project, enable Maps API, generate an API key, add it to the app, and configure permissions.

Notes

4. Testing and Publishing Android Applications for Telecom Devices

Telecom Sector Skill Council

Unit 4.1 – Testing and Validating Android Applications

Unit 4.2 – Publishing Android Applications

TEL/N2302

Key Learning Outcomes 

After the completion of this module, the participant will be able to:

1. Explain the purpose and types of testing used in Android applications, including functional, UI, compatibility, and network-related testing.
2. Demonstrate the execution of predefined test cases and checklists to validate application functionality, usability, and performance.
3. Describe the process of identifying, documenting, and reporting software defects and security issues during testing.
4. Explain the procedures involved in preparing an Android application for release, including versioning, signing, and packaging.
5. Demonstrate the process of uploading application builds and completing publishing requirements for app stores or internal platforms.
6. Describe methods for monitoring app performance, crash reports, and user feedback to support continuous improvement.

UNIT 4.1: Testing and Publishing

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe various Android application testing types and their relevance to different features.
2. Demonstrate the execution of test cases and scripts to validate functional and usability aspects of applications.
3. Perform compatibility and network-related testing across devices, Android versions, and screen sizes using guided tools.
4. Apply standard UI/UX and accessibility guidelines while validating app interfaces.
5. Document and communicate software defects, performance issues, and test observations to the development team.
6. Demonstrate basic security and performance validation using standard testing tools and procedures.
7. Collect and organize test data and logs for analysis and review by the quality assurance team.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

4.1.1 Note

This is the fourteenth session of the program which talks about testing and publishing.

4.1.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

4.1.3 Do

1. Begin with revising the things explained in the previous session. Ask the following questions
   - What is SQLite?
   - What is meant by a database?
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

4.1.4 Say

Now let us begin with a new session which is about learning how to test the applications we have written and then we will learn how we can publish those applications on Google Play or on a third party Website.

4.1.5 Do

Refer to the participant handbook (Pg-134-140 and 144-145) to explain about how to test an application and then publish it on Google Play or a third party Website.

4.1.6 Activity

Provide each participant with a system and ask them to test an application and then publish it.

Go around the class to check whether the participants are testing the application correctly or not.

At the end of the activity reiterate what has been taught to end the activity successfully.

Skill Practice	Time	Resources
Testing an application and publishing	32 hrs	Participant Handbook, Computer

4.1.7 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

4.1.8 Summary

1. Some areas in the development of android which should be taken into consideration are as following:
    - Activity lifecycle
    - Database and file system operations
    - Device hardware
2. Types of testing are:
    - Unit Testing
    - Alpha Testing
    - Beta Testing
    - UI Testing
    - User Acceptance Test
    - Performance Test
    - System Test
3. Debugging may be defined as resolving defects that prevent proper function of software or a device.

UNIT 4.2: Publishing Android Applications

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the essential publishing requirements and compliance criteria for releasing Android applications on app stores.
2. Demonstrate the process of versioning, signing, and packaging Android applications for deployment.
3. Complete metadata and release documentation accurately for Play Store or internal app store submission.
4. Demonstrate the uploading of application builds to designated distribution platforms under supervision.
5. Monitor and interpret crash reports, analytics, and user feedback to support post-release improvements.

Resources to be Used

Participant Handbook, Pens / pencils, Sticky Notes, Notepad, Computer, Projector, White board.

4.2.1 Note

This is the fifteenth session of the program which talks about networking and publishing of a project.

4.2.2 Say

Good morning and a very warm welcome to this training program 'Android Application Technician - Telecom Devices'. Before we begin this session let us have a quick recap of the previous session.

4.2.3 Do

1. Begin with revising the things explained in the previous session. Ask the following questions
   - What is a malware?
   - Name a malware that you know
2. Encourage the participants to give their response
3. Ensure that the class should not lose focus
4. Clarify if they have any doubts
5. Tell them about what they are going to learn in this session

4.2.4 Say

Now let us begin with a new session which is about learning how to ask for permissions and make the applications secure.

4.2.5 Do

Refer to the participant handbook to explain about network protocols,configuration of application and publishing a project through network.

4.2.6 Activity

Ask the participants to refer to Participant Handbook and study in detail the steps to publish a project, configure the application, type of protocols used. Publish it through email and website.

Skill Practice	Time	Resources
Configure the application, release the application	6 hrs	Participant Handbook

4.2.7 Notes for Facilitation

- Ask the participants if they have any questions
- Encourage other participants to answer it and to encourage peer learning in the class
- Clarify all doubts of the participants
- Ask them to answer the questions given in the participant handbook
- Ensure that all the participants answer every question

4.2.8 Summary

1. we read the steps of networking and publishing.
2. Publishing is the process of releasing the application so that users can access it.
3. configuring the application for release
4. Releasing it through email and website.

Exercise

Answers to exercises for PHB

A. Multiple Choice Answers

1. b) Compatibility testing
2. b) Logcat
3. c) HTTPS
4. b) Running long-running background tasks
5. a) Firebase Crashlytics
6. c) Identify the internal version for updates
7. b) Privacy policy

B. Fill in the Blanks:

1. Functional
2. Emulator
3. ADB
4. Signed
5. Deployment
6. Steps
7. CPU
8. Privacy
9. General Data Protection Regulation
10. Post-release

C. Short Answer Questions:

1. Functional testing verifies that app features work as per requirements; e.g., testing login functionality.
2. It ensures the app works smoothly on different devices and Android versions, improving user satisfaction.
3. It lists the top security risks for mobile apps and helps developers build secure applications.
4. Installing apps and capturing logs from devices.
5. It ensures the app looks consistent and performs smoothly on all screen sizes and resolutions.
6. SAST tests code without execution, while DAST tests the running application for vulnerabilities.
7. Versioning manages updates; signing verifies app authenticity before publishing.
8. App title, description, and screenshots.
9. CI automates testing and builds to detect errors early and maintain code quality.
10. It collects crash reports and performance data to help identify and fix post-release issues.

Notes

5. Sustainably Practices in the Development of Mobile Applications

Telecom Sector Skill Council

Unit 5.1 – Sustainable Coding Practices
Unit 5.2 – Application Performance Optimization
Unit 5.3 – Network and Data Usage Reduction
Unit 5.4 – Environmental Standards Compliance
Unit 5.5 – Sustainable UI/UX Design
Unit 5.6 – Sustainable Development Practices

TEL/N2301

Key Learning Outcomes

After the completion of this unit, the participant will be able to:

1. Explain the concept and importance of sustainability in mobile application development and its role in reducing environmental impact.
2. Demonstrate sustainable coding practices by writing optimized and efficient code that minimizes processing power, memory usage, and redundant computations.
3. Apply performance optimization techniques to manage system resources efficiently and reduce battery and storage consumption in mobile applications.
4. Implement data and network optimization methods, including caching, compression, and efficient data formats, to reduce bandwidth and energy usage.
5. Describe key environmental regulations, frameworks, and green software standards relevant to sustainable mobile application development.
6. Design user interfaces and experiences that support sustainability, including dark mode, adaptive themes, and adjustable performance settings.
7. Promote sustainable development practices by adopting cloud services powered by renewable energy, digital collaboration tools, and reusable code components.

UNIT 5.1: Sustainable Coding Practices

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the importance of sustainable and energy-efficient coding in mobile application development.
2. Demonstrate the writing of optimized and efficient code to reduce CPU load and memory consumption.
3. Apply energy-efficient algorithms and suitable data structures to enhance processing performance.
4. Identify and eliminate redundant code segments and unnecessary computations to improve overall efficiency.
5. Describe how optimized coding contributes to lower energy usage and improved device sustainability.

Resources to be Used

Participant handbook, laptop/desktop system, Android Studio, emulator or test device, sample source code files, internet connection, whiteboard, flipchart, markers, projector.

Note

In this unit, we will focus on how efficient and optimized coding helps reduce battery consumption, improves application performance, and supports long-term device sustainability.

Say

Good Morning everyone!
In today's session, we will understand how the way we write code directly affects battery life, device performance, and even the environment. As developers and technicians, writing energy-efficient code is not just a technical skill—it is also a responsibility toward sustainable technology.

Ask

Ask the participants:

- Have you ever noticed your phone battery draining faster after installing a new app?
- Why do you think some apps make the phone heat up quickly?
- What do you understand by "optimized code"?

Write their answers on the whiteboard or flipchart. Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- Meaning of sustainable and energy-efficient coding
- Choosing suitable data structures for fast processing
- Removing unnecessary loops and repeated calculations
- Avoiding excessive object creation
- Impact of optimized coding

Say

Let us now move into a practical activity where you will compare inefficient code with optimized code and observe the performance difference.

Activity

- **Duration**: 60 minutes
- **Resources**: Android Studio, laptop, emulator/device, sample inefficient code files.
- **Steps**:
  1. Divide the class into small groups.
  2. Provide each group with a sample Android program containing inefficient code.
  3. Ask each group to:
     - dentify redundant loops
     - Detect unnecessary object creation
     - Find repeated calculations
  4. Run both versions of the code and compare

Do

- Walk around and support trainees during code analysis.
- Help them understand why certain code blocks are inefficient.
- Encourage logical thinking while optimizing algorithms.
- Demonstrate how small changes can significantly reduce CPU and memory usage.
- Ask one group to explain what optimizations they applied and what improvements they observed.

Notes for Facilitation

- Encourage active participation from all trainees.
- Promote peer learning and group discussions.
- Clarify doubts immediately to ensure concept clarity.
- Relate topics to real-field and industry scenarios.
- Ensure safety practices are followed during practical sessions.

UNIT 5.2: Application Performance Optimization

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the significance of performance optimization in reducing device energy and resource usage.
2. Demonstrate efficient resource management techniques to minimize battery consumption during app operation.
3. Apply methods to optimize background processes and data retrieval for improved responsiveness and efficiency.
4. Implement strategies to reduce application size by removing redundant assets and compressing files.
5. Describe how performance optimization enhances user experience and supports sustainable mobile application design.

Resources to be Used

Participant handbook, laptop/desktop system, Android Studio, emulator or test device, sample Android apps and APK files, profiling tools (CPU, Memory, Network), internet connection, whiteboard, flipchart, markers, projector.

Note

In this unit, we will discuss how performance optimization and proper resource handling not only improve app speed and user experience but also reduce battery drain, memory usage, and overall environmental impact.

Say

Good Morning everyone!
In today's session, we will learn how to make mobile applications smarter, lighter, and faster. Performance optimization is not just about speed—it is also about saving battery, reducing memory load, and building apps that are sustainable and user-friendly.

Ask

Ask the participants:

- Have you ever uninstalled an app because it was too slow or consumed too much battery?
- Why do you think some apps load faster than others?
- What problems can occur if an app is very large in size?

Write their answers on the whiteboard or flipchart. Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- Meaning of performance optimization in mobile applications
- Relationship between performance and energy consumption
- Battery-saving techniques during app operation
- Optimizing background processes
- Optimizing data retrieval

Say

Let us now move into a practical activity where you will analyze an app's performance and apply optimization techniques.

Activity

- **Duration**: 60 minutes
- **Resources**: Android Studio, laptop, emulator/device, sample inefficient code files.
- **Steps**:
  1. Divide the class into small groups.
  2. Provide each group with a sample Android application that has performance issues.
  3. Ask each group to:
     - Analyze CPU, memory, and network usage using profiling tools
     - Identify unnecessary background processes
     - Remove unused assets and compress images and files
  4. Compare the app size, speed, and resource usage before and after optimization.

Do

- Assist trainees while using profiling tools.
- Help them correctly interpret CPU, memory, and network graphs.
- Guide them in safely removing unused files and assets.
- Encourage each trainee to participate in at least one optimization task.
- Ask one group to explain the improvements achieved after optimization..

Notes for Facilitation

- Encourage active participation from all trainees.
- Promote peer learning and group discussions.
- Clarify doubts immediately to ensure concept clarity.
- Relate topics to real-field and industry scenarios.
- Ensure safety practices are followed during practical sessions.

UNIT 5.3: Network and Data Usage Reduction

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Understand strategies to optimize network performance and reduce data transfer.
2. Learn to minimize redundant network requests through the use of caching mechanisms.
3. Apply knowledge of efficient data formats to reduce processing load and improve application responsiveness.

Resources to be Used

Participant handbook, laptop/desktop system, Android Studio, emulator or test device, internet connection, sample app with network calls, demo APIs, profiling tools (Network Profiler), whiteboard, flipchart, markers, projector.

Note

In this unit, we will focus on how smart network usage, caching techniques, and efficient data formats help in reducing data consumption, improving app speed, and enhancing overall user experience.

Say

Good Morning everyone!
In today's session, we will learn how mobile applications communicate over the network in a smart and efficient way. You will understand how reducing unnecessary data transfer not only makes apps faster but also saves mobile data and battery power.

Ask

Ask the participants:

- Have you ever noticed that some apps work smoothly even on slow internet?
- Why do you think some apps consume a lot of mobile data?
- What happens if the same data is downloaded again and again?

Write their answers on the whiteboard or flipchart. Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- Meaning of network performance in mobile applications
- Factors that affect network performance
- Strategies to optimize network performance
- Concept of caching and why it is important
- Introduction to efficient data formats

Say

Let us now move into a practical activity where you will observe the impact of caching and efficient data handling on real app performance.

Activity

- **Duration**: 60 minutes
- **Resources**: Android Studio, emulator/device, demo API, sample app with network requests, network profiler.
- **Steps**:
  1. Divide the class into small groups and provide each group with a sample Android app that fetches data from the internet.
  2. Ask trainees to run the app without caching and observe loading time and data usage using the Network Profiler.
  3. Guide trainees to implement basic caching in the app and reload the same data.
  4. Ask them to compare network usage and loading time before and after caching.
  5. Finally, demonstrate how using a lightweight data format improves app responsiveness.

Do

- Guide trainees while using the network profiler.
- Help them identify redundant network requests.
- Assist them in implementing basic caching logic correctly.
- Encourage logical comparison of before-and-after performance results.
- Ask one group to explain how caching improved network efficiency in their application.

Notes for Facilitation

- Encourage active participation from all trainees.
- Promote peer learning and group discussions.
- Clarify doubts immediately to ensure concept clarity.
- Relate topics to real-field and industry scenarios.
- Ensure safety practices are followed during practical sessions.

UNIT 5.4: Environmental Standards Compliance

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Understand and adhere to environmental regulations and guidelines promoting digital sustainability.
2. Learn to apply sustainable software development frameworks and tools during application design and development.
3. Implement green software engineering best practices to minimize environmental impact in software operations.

Resources to be Used

Participant handbook, laptop/desktop systems, Android Studio or relevant IDE, internet connection, projector, whiteboard, markers, sample application code, sustainability framework documents, energy consumption monitoring tools.

Note

This unit introduces the concept of digital sustainability, where software design decisions directly impact energy usage, device lifespan, and overall environmental responsibility.

Say

Good Morning everyone!

Until now, we have focused on building functional and efficient applications. Today, we will take one step further and learn how to make our applications environment-friendly. You will understand how your coding choices can actually reduce power consumption, hardware stress, and environmental impact.

Ask

Ask the participants:

- Do you think software applications can affect electricity consumption?
- Have you ever noticed your phone heating up or battery draining quickly because of an app?
- Why do you think governments are now talking about digital sustainability?

Write their answers on the whiteboard or flipchart. Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- Meaning of digital sustainability
- Role of software in energy consumption and carbon footprint
- Overview of environmental regulations and digital sustainability guidelines
- Importance of following environmental standards in software development
- Introduction to sustainable software development frameworks

Say

Now let us perform a practical session to observe how optimized coding directly impacts power and resource usage.

Activity

- **Duration**: 60 minutes
- **Resources**: Sample mobile apps, Android Studio, emulator/real device, energy profiler, internet connection..
- **Steps**:
  1. Divide trainees into small groups and give them a sample app with background activity and frequent network updates.
  2. Ask them to monitor CPU, memory, and battery usage.
  3. Guide them to reduce background tasks, optimize sync intervals, and remove redundant logic.
  4. Re-test the app after optimization.
  5. Compare battery, CPU, and memory usage before and after optimization.

Do

- Support trainees in identifying energy-heavy processes.
- Demonstrate how optimized coding reduces system load.
- Help trainees apply basic sustainability-focused improvements.
- Encourage them to explain how their changes supported green software goals.
- Correct inefficient logic wherever required.

Notes for Facilitation

- Encourage active participation from all trainees.
- Promote peer learning and group discussions.
- Clarify doubts immediately to ensure concept clarity.
- Relate topics to real-field and industry scenarios.
- Ensure safety practices are followed during practical sessions.

UNIT 5.5: Sustainable UI/UX Design

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Learn to design energy-efficient user interfaces using dark mode and adaptive themes.
2. Understand methods to optimize animations and visual effects for reduced processing and power consumption.
3. Learn skills to enable user-controlled performance settings that enhance energy efficiency and sustainability.

Resources to be Used

Participant handbook, laptop/desktop systems, Android Studio or relevant IDE, emulator or mobile device, projector, whiteboard, markers, sample UI design layouts, performance profiling tools.

Note

In this unit, trainees will learn how user interface design directly affects battery life, processing speed, and device sustainability, and how small design choices can create a big environmental impact.

Say

Good Morning everyone!

All of us use mobile apps daily, but have you ever noticed how some apps drain the battery very fast while others last much longer? Today, we will explore how smart UI design and performance controls can help save energy, improve battery life, and make applications more sustainable.

Ask

Ask the participants:

- Have you used dark mode on your phone or apps?
- Do you feel that your phone lasts longer on dark mode? Why do you think so?
- Which apps do you feel consume the most battery and why?

Write their answers on the whiteboard or flipchart. Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- What is energy-efficient UI design
- Impact of screen brightness, colors, and animations on battery consumption
- Optimizing animations and visual effects
- How visual effects affect CPU and GPU usage
- Meaning of user-controlled performance settings

Say

Now let us perform a hands-on activity to understand how UI design and animations affect performance and power consumption.

Activity

- **Duration**: 60 minutes
- **Resources**: Android Studio, sample app project, emulator/mobile device, battery and performance profiler.
- **Steps**:
  1. Divide trainees into small groups and provide a sample app with a bright UI and heavy animations.
  2. Ask them to observe CPU usage and monitor battery drain.
  3. Guide them to enable dark mode, reduce animations, and add a performance mode.
  4. Re-test the app after applying the changes.
  5. Compare battery usage and CPU/GPU load before and after optimization.

Do

- Demonstrate the difference between light mode and dark mode power usage.
- Guide trainees in modifying animation settings.
- Help them add basic performance control options.
- Encourage them to analyze changes using performance tools.
- Ensure that each group explains what optimization they performed and why.

Notes for Facilitation

- Encourage active participation from all trainees.
- Promote peer learning and group discussions.
- Clarify doubts immediately to ensure concept clarity.
- Relate topics to real-field and industry scenarios.
- Ensure safety practices are followed during practical sessions.

UNIT 5.6: Sustainable Development Practices

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Understand how to leverage cloud computing solutions powered by renewable energy to support sustainable development.
2. Learn to adopt remote work and digital collaboration tools that contribute to reducing the carbon footprint.
3. Apply practices to reuse existing components and libraries for minimizing digital waste and resource consumption.

Resources to be Used

Participant handbook, laptop/desktop systems, internet connection, projector, whiteboard, markers, cloud service dashboards (demo), digital collaboration tools (Zoom, Google Workspace, MS Teams – demo), sample code libraries and repositories.

Note

In this unit, trainees will understand how cloud computing, remote collaboration, and smart reuse of digital resources play a critical role in reducing environmental impact while improving efficiency.

Say

Good Morning everyone!

Today, we will explore how technology itself can support environmental protection. You will learn how cloud computing, online collaboration, and reuse of software components help reduce energy use, travel pollution, and digital waste. These practices are becoming essential in all technical fields.

Ask

Ask the participants:

- Have you ever stored files on Google Drive or used online meetings?
- Do you think working from home reduces pollution?
- How?Have you ever reused code or templates in your projects?

Write their answers on the whiteboard or flipchart. Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- Introduction to sustainable cloud computing
- What is green cloud infrastructure
- Concept of remote work and digital collaboration
- Meaning of digital waste in software developmentImportance of reusing code, components, and libraries

Say

Now let us perform a practical activity to understand how cloud services, digital collaboration, and resource reuse work in real-life scenarios.

Activity

- **Duration**: 60 minutes
- **Resources**: Internet-enabled systems, cloud storage platform, collaboration tools, sample code repositories.
- **Steps**:
  1. Divide trainees into small groups and assign one group to file sharing via cloud storage.
  2. Assign another group to conduct a short online meeting using a collaboration tool.
  3. Assign a third group to identify reusable components from a sample project.
  4. Ask each group to explain how their activity supports sustainability.
  5. Have them identify the environmental benefits of their method.

Do

- Demonstrate how cloud platforms replace physical storage devices.
- Show how online meetings replace travel.
- Help trainees identify reusable libraries and components.
- Encourage trainees to share ideas on reducing digital waste.
- Ensure each group actively participates and explains their learning.

Notes for Facilitation

- Encourage active participation from all trainees.
- Promote peer learning and group discussions.
- Clarify doubts immediately to ensure concept clarity.
- Relate topics to real-field and industry scenarios.
- Ensure safety practices are followed during practical sessions.

Exercise

Answers to exercises for PHB

A. Multiple Choice Answers

1. b) Writing code that minimizes energy and resource consumption
2. b) To reduce data transfer and improve speed
3. c) Stale-While-Revalidate
4. b) Data center efficiency
5. b) Black pixels consume no power
6. c) Using renewable energy-powered cloud providers

B. Fill in the Blanks:

1. CPU
2. JSON
3. Environmental
4. Dark
5. Recycling

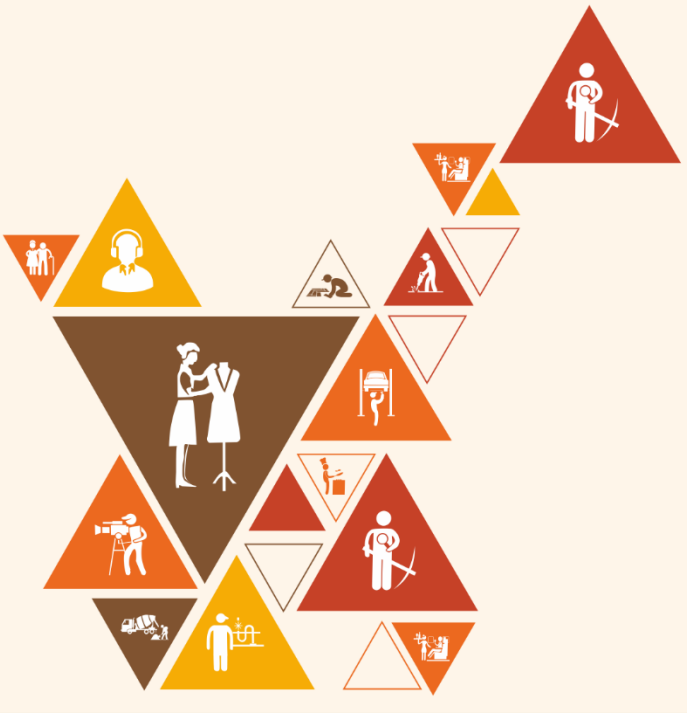
C. Short Answer Questions:

1. Improves app performance and reduces battery consumption.
2. Caching data and using request batching.
3. They reduce energy consumption, lower carbon emissions, and optimize resource usage.
4. Enabling battery saver and restricting background app activity.
5. They reduce carbon emissions and promote clean energy usage while supporting scalable computing.
6. Reduced paper usage, lower travel-related emissions, and decreased overall environmental impact.

Notes

6. Employability Skills (30 Hours)

It is recommended that all training include the appropriate. Employability Skills Module. Content for the same can be accessed https://www.skillindiadigital.gov.in/content/list



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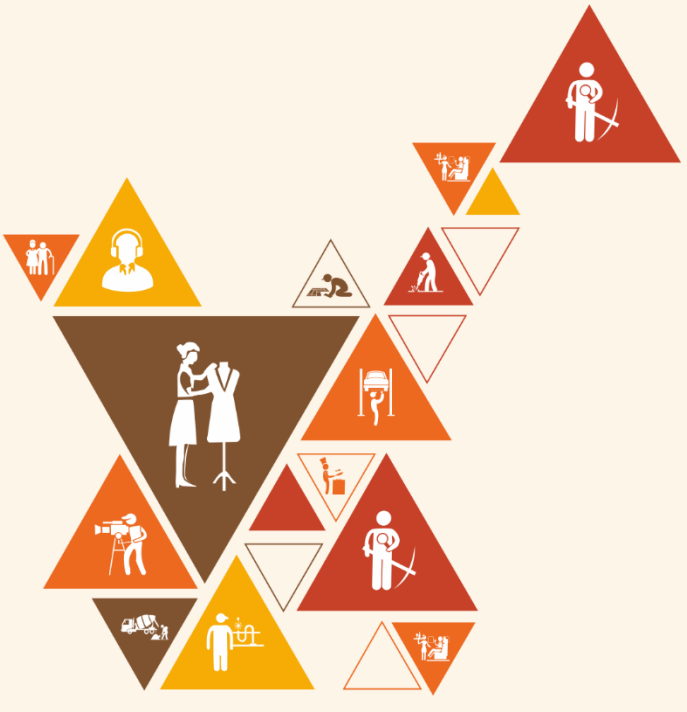
7. Annexure

Annexure I: Training Delivery Plan

Annexure II: Assessment Criteria

Annexure III: List of QR Codes used in PHB



Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Android Application Technician – Telecom Devices		
Qualification Pack Name & Ref. ID	TEL/ Q2300		
Version No.	6.0	**Version Update Date**	08-05-2025
Pre-requisites to Training (if any)	N.A.		
Training Outcomes	**After the completion of this program, the participants will be able to:** • Explain how to assist in setting up an Android application environment and configuring basic user interfaces using standard tools • Describe how to assist in the integration of Value Added Services (VAS) such as messaging, location, and background tasks in Android applications • Show the steps to assist in testing and publishing Android applications for telecom terminal devices under supervision • Discuss the importance of sustainability practices in mobile application development and their positive impact on telecom operations and the environment • Demonstrate basic employability and entrepreneurial skills, including communication, teamwork, problem-solving, and awareness of business opportunities.		

Sl. No.	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration (hours)
1	Introduction to the sector and the job role of a Android Application Technician – Telecom Devices (Theory- 05:00 Hours Practical- 00:00)	Introduction to the program Introduction to the Telecom Sector and Role of Android Application Technician - Telecom Devices	• The overview of the Program • The role and responsibilities of Android Application Technician - Telecom Devices • Rules for Efficient Learning in the class room • Discuss the outcome of this training program and the employment opportunities for the trainees. • History of commnication • signals used for commnication	Bridge module	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Laptop with software like MS Office and internet, Whiteboard, Marker, Projector	T - 02:00 P - 00:00
		Communication Network & Channel Access Methods	• Modes of Mobile Communication • Generations of Mobile communication • Channel Access Methods • Multiplexing Technology				T - 01:00 P - 00:00
		Mobile Operating System, Windows Mobile and Versions of Android	• Mobile Operating Systems • Definition of Mobile Operating Systems • Application Development Environment • Windows Mobile • Versions of Android • Blackberry OS, MIDP				T - 01:00 P - 00:00
		Basic Requirements for Android Installation and Android Installation Steps	• Features of Android OS • Versions of Android OS • System requirement for installing Android Studio • Installation of Android Studio				T - 01:00 P - 00:00
2	TEL/N2300: Assist in Configuring Android Environment and User Interface for Telecom Devices (Theory- 65:00 Hours Practical- 70:00 Hours)	Android Core Overview	Understand Android ecosystem, versions, and device types	TEL/N2300 PC1, PC2, KU1–KU3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Laptop with software like MS Office and internet, Whiteboard, Marker, Projector, JDK software, IDE for android application development	T - 04:00 P - 04:00
		Mobile Hardware Components	Identify internal and external mobile components	TEL/N2300 PC3, PC4, KU4–KU6			T - 04:00 P - 04:00
		Android OS Architecture	Understand Android layers and system structure	TEL/N2300 PC2, KU2–KU5			T - 04:00 P - 04:00
		Device Boot Process	Learn boot stages and recovery modes	TEL/N2300 PC5, KU7–KU8			T - 04:00 P - 04:00
		ROM, RAM, Storage	Understand memory types and management	TEL/N2300 PC6, KU9–KU11			T - 04:00 P - 04:00
		Power & Battery Management	Diagnose battery and power issues	TEL/N2300 PC7, PC8, KU12–KU14			T - 04:00 P - 04:00
		Android Settings Configuration	Configure language, network, and security	TEL/N2300 PC9, KU15–KU16			T - 04:00 P - 04:00
		Network Connectivity Basics	Configure Wi-Fi, mobile data, and hotspot	TEL/N2300 PC10, KU17–KU18			T - 04:00 P - 04:00
		App Installation Methods	Install apps using Play Store and APK	TEL/N2300 PC11, KU19–KU20			T - 04:00 P - 04:00
		File System & Data Transfer	Manage files and perform data backup	TEL/N2300 PC12, KU21–KU22			T - 04:00 P - 04:00
		Common Device Issues	Identify lag, freeze, and boot loop issues	TEL/N2300 PC13, KU23–KU24			T - 04:00 P - 04:00
		Basic Troubleshooting	Apply structured fault diagnosis	TEL/N2300 PC14, KU25–KU26			T - 04:00 P - 04:00
		Reset & Recovery	Perform soft and hard reset	TEL/N2300 PC15, KU27–KU28			T - 04:00 P - 04:00
		Android Core Overview	Understand Android ecosystem, versions, and device types	TEL/N2300 PC1, PC2, KU1–KU3			T - 04:00 P - 04:00
		Software Updating	Perform OTA and manual updates	TEL/N2300 PC16, KU29–KU30			T - 04:00 P - 04:00
		Security & Lock Management	Handle screen lock and FRP issues	TEL/N2300 PC17, KU31–KU32			T - 02:30 P - 05:00
		Customer Handling Basics	Communicate technical issues clearly	TEL/N2300 PC18, KU33–KU35			T - 02:30 P - 05:00

3	TEL/N2301: Assist in Configuring Value Added Services (VAS) in Android Applications for Telecom Devices (Theory- 20:00 Hours Practical- 60:00 Hours)	Introduction to App Development	Understand app lifecycle and structure	TEL/N2301 PC1, KU1–KU3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Tablets of different brands Laptop with software like MS Office and internet, Whiteboard, Marker, Projecto, SQLIte	T - 02:00 P - 06:00
		Android Studio Overview	Navigate IDE and project setup	TEL/N2301 PC2, KU4–KU5			T - 02:00 P - 06:00
		UI Layout Basics	Design simple application layouts	TEL/N2301 PC3, KU6–KU7			T - 02:00 P - 06:00
		Activities & Intents	Understand screen navigation	TEL/N2301 PC4, KU8–KU9			T - 02:00 P - 06:00
		Input Controls & Buttons	Design interactive interfaces	TEL/N2301 PC5, KU10–KU11			T - 02:00 P - 06:00
		Data Storage Basics	Use shared preferences and files	TEL/N2301 PC6, KU12–KU13			T - 02:00 P - 06:00
		Debugging Concepts	Identify and fix code errors	TEL/N2301 PC7, KU14–KU15			T - 02:00 P - 06:00
		App Testing Techniques	Perform functional testing	TEL/N2301 PC8, KU16–KU17			T - 02:00 P - 06:00
		Performance Optimization	Improve app speed and stability	TEL/N2301 PC9, KU18–KU19			T - 02:00 P - 06:00
		App Development Assessment	Demonstrate basic app build and test	TEL/N2301 PC1–PC9, KU1–KU19			T - 02:00 P - 06:00
3	TEL/N2302: Assist in Testing and Releasing Android Applications for Telecom Devices (Theory- 20:00 Hours Practical- 60:00 Hours)	APK Generation	Create deployable app package	TEL/N2302 PC1, KU1–KU2	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Tablets of different brands Laptop with software like MS Office and internet, Whiteboard, Marker, Projecto, SQLIte	T - 02:00 P - 06:00
		App Deployment Process	Install app on target devices	TEL/N2302 PC2, KU3–KU4			T - 02:00 P - 06:00
		Play Store Publishing Overview	Understand listing and compliance	TEL/N2302 PC3, KU5–KU6			T - 02:00 P - 06:00
		Version Control & Updates	Manage application versions	TEL/N2302 PC4, KU7–KU8			T - 02:00 P - 06:00
		App Security Basics	Understand data security and permissions	TEL/N2302 PC5, KU9–KU10			T - 02:00 P - 06:00
		Bug Fixing Techniques	Resolve post-deployment issues	TEL/N2302 PC6, KU11–KU12			T - 02:00 P - 06:00
		Performance Monitoring	Track app usage and crashes	TEL/N2302 PC7, KU13–KU14			T - 02:00 P - 06:00
		User Feedback & Support	Handle customer issues	TEL/N2302 PC8, KU15–KU16			T - 02:00 P - 06:00
		App Maintenance Procedures	Apply scheduled updates and patches	TEL/N2302 PC9, KU17–KU18			T - 02:00 P - 06:00
		Deployment & Maintenance Assessment	Demonstrate full deployment flow	TEL/N2302 PC1–PC9, KU1–KU18			T - 02:00 P - 06:00

5	TEL/N9110: Follow sustainability practices in the development of mobile applications	Workplace Safety	Follow electrical and lab safety rules	TEL/N9110 PC1, KU1–KU3	Lecture, Demonstration, Safety Walkthrough, Visual Briefing	Lecture, Demonstration, Safety Walkthrough, Visual Briefing, Code of conduct handbook, Ethics scenario cards, Roleplay sheets, E-waste bins, Sample components, Recycling symbols chart, Energy meter, Eco-friendly product samples, Sustainability checklist	T - 02:30 P - 05:00
		Professional Ethics	Maintain data privacy and conduct	TEL/N9110 PC2, KU4–KU6			T - 02:30 P - 05:00
		E-Waste Management	Dispose electronic waste correctly	TEL/N9110 PC3, KU7–KU9			T - 02:30 P - 05:00
		Green Work Practices	Apply sustainable work practices	TEL/N9110 PC4, KU10–KU12			T - 02:30 P - 05:00

Annexure II
Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for	
Job Role	Android Application Technician - Telecom Devices
Qualification Pack	TEL/Q2300
Sector Skill Council	Telecom Sector Skill Council

S. No.	Guidelines for Assessment
1	The assessment for the theory part will be based on knowledge bank of questions approved by the SSC.
2	Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/ option NOS/ Set of NOS.
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 criterion.
5	To pass the Qualifications File, every trainee should score a minimum of 50% of aggregate marks.
6	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification File.

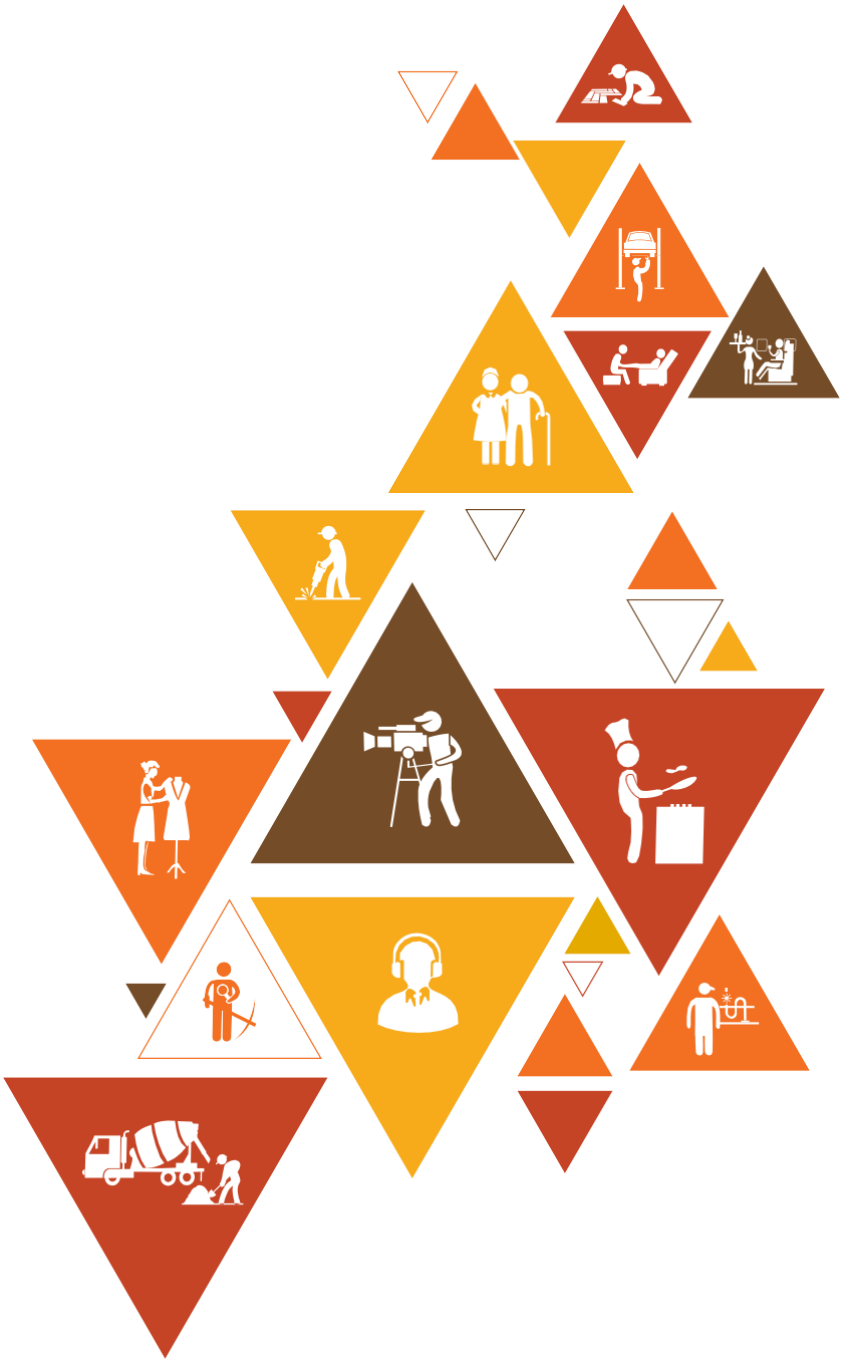
National Occupational Standards	NOS Code & Version	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
Assist in Configuring Android Development Environment and User Interface for Telecom Devices	TEL/N2300, v5.0	30	50	-	20	100	30
Assist in Configuring Value Added Services (VAS) in Android Applications for Telecom Devices	TEL/N2301, v5.0	30	50	-	20	100	25
Assist in Testing and Publishing Android Applications for Telecom Devices	TEL/N2302, v5.0	30	50	-	20	100	25
Follow sustainability practices in the development of mobile applications	TEL/N9110, v1.0	30	50	-	20	100	10
Employability Skills (30 Hours)	DGT/VSQ/N0101, v1.0	20	30	-	-	50	10
Total		**140**	**230**	**-**	**80**	**450**	**100**

Annexure III

QR Codes –Video Links

Chapter No.	Unit Name	Topic	URL Links	QR code (s)
1. Role and Responsibilities of an Android Application Technician – Telecom Devices	Unit 1.1 – Introduction to the Program	Telecom Industry Overview	https://www.youtube.com/watch?v=jmymVdxbKWU&t=24s	Telecom Industry Overview
		Telecommunication process	https://www.youtube.com/shorts/XpXZd7jC3Cs	Telecommunication process
	UNIT 1.2: History of Communication	History of Communication	https://www.youtube.com/watch?v=E4xK2r4MO3U	History of Communication
	UNIT 1.4: Networks	Mobile Telecommunication	https://www.youtube.com/watch?v=ZpcEOwdQ12U	What is mobile telecommunication technologies
	UNIT 1.5: Channel Access Methods	Multiplexing	https://www.youtube.com/watch?v=cEOuzBRJ_gY	Multiplexing
	UNIT 1.7: Legacy Mobile Operating Systems and Concepts	Virtual Private Networking (VPN)	http://youtube.com/watch?v=JFXBjlT5cGU	What is VPN
	UNIT 1.8: Android Operating System and Version History	App Development Process	https://www.youtube.com/watch?v=4JqhErux_P8	App Development Process

Chapter No.	Unit Name	Topic	URL Links	QR code (s)
	UNIT 1.10: Android Studio Installation and Setup	How to Install Android Studio	https://www.youtube.com/watch?v=6uZPVmOzUEA	How to Install Android Studio
2. Setting up Android framework/ Development Environment and creating user interface (TEL/N2300)	UNIT 2.1: Creating Simple Android Project in Android Studio	Creating a Simple Android Project	https://www.youtube.com/watch?v=-NsdkRbi4sY	How to Create Your First Android Project in Android Studio
3. Configuring Value Added Services (VAS) in Android Applications for Telecom Devices (TEL/N2301)	UNIT 3.1: Managing Data within Android Applications	Android App Activity Lifecycle	https://www.youtube.com/watch?v=1sjA4e_wG3w	Android App Activity Lifecycle
5. Follow Sustainability Practices in Telecom Cabling Operations	Unit 5.1 - Sustainability Practices in Telecom Cabling Operations	What Are Regulatory Compliance Requirements?	https://www.youtube.com/watch?v=WvyWmXrDTwM	What Are Regulatory Compliance Requirements?



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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

Telecom Sector Skill Council

Telecom Sector Skill Council
Estel House,3rd Floor, Plot No: - 126, Sector-44
Gurgaon, Haryana 122003
Phone: 0124-2222222
Email: tssc@tsscindia.com
Website: www.tsscindia.com