



Model Curriculum

QP Name: IoT Technical Service Operator

QP Code: TEL/Q6214

Version: 1.0

NSQF Level: 3

Model Curriculum Version: 1.0

Telecom Sector Skill Council || 3rd Floor, Plot No 126, Sector – 44
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Training Parameters

Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation & Maintenance
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3114.6214
Minimum Educational Qualification and Experience	Class 10th Pass OR Class 8th Pass and pursuing continuous regular schooling OR Class 8th Pass + ITI (2 years in Electronics/Telecom/IT and other relevant fields)
Pre-Requisite License or Training	NA
Minimum Job Entry Age	15 Years
Last Reviewed On	30/06/2022
Next Review Date	30/06/2025
NSQC Approval Date	30/06/2022
QP Version	1.0
Model Curriculum Creation Date	30/06/2022
Model Curriculum Valid Up to Date	30/06/2025
Model Curriculum Version	1.0
Minimum Duration of the Course	450 Hours
Maximum Duration of the Course	720 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Demonstrate the process of carrying out troubleshooting for IoT devices and connectivity issues.
- Describe the process of assisting in providing IoT solutions to clients.
- Explain the importance of implementing effective communication and coordination at work.
- Explain the importance of managing work and resources and ensuring health and safety at work.
- Describe the process of assisting in creating smart cities by implementing Internet of Things (IoT) solutions.
- Describe the process of using Internet of Things (IoT) technology in agriculture.
- Describe the process of using Internet of Things (IoT) technology in telemedicine.
- Describe the process of using Internet of Things (IoT) technology in transport.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	08:00	04:00	20:00	-	32:00
Module 1: Introduction to the role of an IoT Technical Service Operator	08:00	04:00	20:00	-	32:00
TEL/N6252: Carry out Troubleshooting for IoT Devices and Connectivity Issues NOS Version-1.0 NSQF Level- 3	30:00	50:00	50:00	-	130:00
Module 2: Process of carrying out troubleshooting for IoT devices and connectivity issues	30:00	50:00	50:00	-	130:00
TEL/N6253: Assist in Providing IoT Solutions to Clients NOS Version-1.0 NSQF Level- 3	20:00	48:00	50:00	-	118:00

Module 3: Process of assisting in providing IoT solutions to clients	20:00	48:00	50:00	-	118:00
TEL/N9101: Organise Work and Resources as per Health and Safety Standards NOS Version-1.0 NSQF Level-4	16:00	24:00	00:00	-	40:00
Module 4: Process of organising work and resources as per health and safety standards	16:00	24:00	00:00	-	40:00
TEL/N9102: Interact Effectively with Team Members and Customers NOS Version-1.0 NSQF Level-4	16:00	24:00	00:00	-	40:00
Module 5: Process of interacting effectively with team members and customers	16:00	24:00	00:00	-	40:00
Total Duration	90:00	150:00	120:00	-	360:00

Elective Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

Elective - 1: IoT - Smart City

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
TEL/N6254: Assist in Creating Smart Cities by Implementing Internet of Things (IoT) Solutions NOS Version-1.0 NSQF Level- 3	30:00	30:00	30:00	-	90:00
Module 6: Process of assisting in creating smart cities by implementing Internet of Things (IoT) solutions	30:00	30:00	30:00	-	90:00
Total Duration	30:00	30:00	30:00	-	90:00

Elective - 2: IoT - Agriculture

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
TEL/N6255: Use Internet of Things (IoT) Technology in Agriculture NOS Version-1.0 NSQF Level- 3	30:00	30:00	30:00	-	90:00
Module 7: Process of using Internet of Things (IoT) technology in agriculture	30:00	30:00	30:00	-	90:00
Total Duration	30:00	30:00	30:00	-	90:00

Elective - 3: IoT - Telemedicine

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
TEL/N6256: Use Internet of Things (IoT)	30:00	30:00	30:00	-	90:00

Technology in Telemedicine NOS Version-1.0 NSQF Level- 3					
Module 8: Process of using Internet of Things (IoT) technology in telemedicine	30:00	30:00	30:00	-	90:00
Total Duration	30:00	30:00	30:00	-	90:00

Elective - 4: IoT - Transport

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
TEL/N6257: Use Internet of Things (IoT) Technology in Transport NOS Version-1.0 NSQF Level- 3	30:00	30:00	30:00	-	90:00
Module 9: Process of using Internet of Things (IoT) technology in transport	30:00	30:00	30:00	-	90:00
Total Duration	30:00	30:00	30:00	-	90:00

Module Details

Module 1: Introduction to the role of an IoT Technical Service Operator

Bridge Module

Terminal Outcomes:

- Discuss the job role of an IoT Technical Service Operator.
- Explain the scope of work for an IoT Technical Service Operator.

Duration: 08:00	Duration: 04:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Describe the size and scope of the Telecom industry and its sub-sectors. • Discuss the role and responsibilities of an IoT Technical Service Operator. • Identify various employment opportunities for an IoT Technical Service Operator. • Discuss the organisational policies on workplace ethics, managing sites, quality standards, personnel management and public relations (PR). • Describe the process workflow in the organization and the role of an IoT Technical Service Operator in the process. • List the various daily, weekly, monthly operations/activities that take place at the site under an IoT Technical Service Operator. 	<ul style="list-style-type: none"> • Role play based on case studies, outlining the scope, responsibilities, and challenges of an IoT Technical Service Operator. • Analyse the requirements for the course and prepare for the pre-requisites of the course.
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Process of carrying out troubleshooting for IoT devices and connectivity issues

Mapped to TEL/N6252 v1.0

Terminal Outcomes:

- Demonstrate the process of carrying out troubleshooting for IoT devices and connectivity issues.

Duration: 30:00	Duration: 50:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Describe the process of diagnosing and resolving common and complex IoT device-related issues. • Explain the networking fundamentals, such as Transmission Control Protocol (TCP)/ Internet Protocol (IP), Domain Name System (DNS), Secure Shell (SSH), Secure Sockets Layer (SSL), Hypertext Transfer Protocol (HTTP). • Explain the functioning of a Command Line Interface (CLI). • Explain the functioning of cloud computing platforms, such as AWS, Azure, GCP, etc. • Describe the process of analysing complex data, performing data visualisations and extracting meaningful insights. • Explain different scripting languages, such as BASH, Python or JavaScript. • Describe the process of debugging web applications using developer tools. • Explain the benefits of using Structured Query Language (SQL) in Relational Database Management Systems to handle structured data. • Explain the functioning of different types of microcontrollers/processors. • Explain the basics of C, Embedded C, C++, Arduino. • Explain the fundamentals of digital electronics. 	<ul style="list-style-type: none"> • Demonstrate how to monitor the deployed IoT assets using the cloud system. • Demonstrate the process of checking the power management modules, Radio Frequency (RF), energy and sensing modules for any malfunctioning and carrying out troubleshooting accordingly. • Demonstrate the process of testing to identify issues with different types of microcontrollers and carrying out troubleshooting or replacing the faulty/ damaged microcontrollers with new ones. • Show how to check for uninterrupted communication between RF modules and Wi-Fi, Bluetooth, transceiver, duplexer, etc. • Demonstrate the process of carrying out troubleshooting of electronic circuits using electronic simulation software. • Demonstrate how to examine the sensors and transducers to identify faults with them and carry out appropriate troubleshooting. • Show how to identify issues with Integrated Circuit (ICs) on microcontrollers and repair or replace them, as appropriate. • Show how to check the functioning of 3G/ 4G/ 5G connectivity modules on the IoT devices. • Demonstrate how to test data transfer from the IoT device to the

<ul style="list-style-type: none"> • Explain different types of communication protocols, such as SPI, I2C, UART, Modbus TCP-IP, etc. • State the common issues experienced with different types of microcontrollers and how to resolve them. 	<p>cloud server.</p> <ul style="list-style-type: none"> • Demonstrate how to identify and troubleshoot issues with digital circuits. • Show how to test various types of network cables to identify issues with them and take appropriate remedial action. • Prepare a sample backup of relevant data on the cloud network and/or the relevant storage media as per the organisational policy. • Demonstrate how to test the routing in the network by checking if the IoT device is connected and the link is up. • Show how to use the packet analysis tool to pick up data packets and debug them. • Show how to check if the IoT device is able to send a DHCP packet with a response from the server. • Show how to check if the configuration parameters are correct and the IoT device is able to connect to its cloud controller. • Demonstrate the use of a remote mirroring feature to mirror the traffic from an IoT device on a remote device. • Demonstrate the process of carrying out debugging or appropriate troubleshooting based on the checks performed to restore network connectivity. • Demonstrate the process of performing the assigned troubleshooting tasks within the Service Level Agreement (SLA) following the organisational processes.
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>IP Network Speed Tester, IP Scanner, Integrated Circuit, Laptop /Desktop with pre-installed (Python, SQL Server, Java, C++) languages/ Software, RF Transceiver, Microcontroller Unit.</p>	

Module 3: Process of assisting in providing IoT solutions to clients

Mapped to TEL/N6253 v1.0

Terminal Outcomes:

- Explain the importance of Co-ordinating client services.
- Demonstrate the process of maintaining and reviewing the records.

Duration: 20:00	Duration: 48:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain the importance and process of co-ordinating with the onsite technical teams for the deployments of IoT assets on client premises. • Explain the importance of ensuring the new IoT applications and devices meet the client needs and address the relevant concerns. • Explain the importance and process of co-ordinating with the Radio Frequency (RF) engineer to provide switch and RF related support to end-users. • Explain the importance and process of co-ordinating with the internal and external stakeholders to ensure service availability, quality and continuity assurance. • Explain the importance of ensuring a high level of customer service with a focus on minimum restoration times. • Explain the importance and process of maintaining and reviewing relevant records to identify the appropriate solutions to improve the quality of products and services and client satisfaction. 	<ul style="list-style-type: none"> • Demonstrate how to check the IoT asset connectivity during deployments and assist with performing appropriate troubleshooting. • Demonstrate the process of upgrading IoT devices and peripherals at client premises. • Show how to review the records through coordination with the supervisor to identify underlying client issues/concerns and determine their root cause.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
RF Switches, Bluetooth IoT Tracking Device, iOS embedded Component.	

Module 4: Process of organising work and resources as per health and safety standards

Mapped to NOS TEL/N9101 v1.0

Terminal Outcomes:

- Explain the importance of performing work as per quality standards.
- Explain the importance of maintaining a safe, healthy and secure working environment.
- Explain the importance of conserving material/energy/electricity.
- Describe the process of using effective waste management/recycling practices.

Duration: 16:00	Duration: 24:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain various strategies pertinent to their field (such as internet searches, asking peers and managers, enrolling for courses and certifications, etc.) that can be used to pursue advancement in their skills. • State key performance indicators for the new tasks. • Describe feedback processes and formats. • Explain timelines and goals as well as their relevance to work allocated. • Explain the importance of quality and timely delivery of the product/service. • Explain the escalation matrix and its importance, especially in case of emergencies. • Explain various ways of time and cost management. • State the rules/regulations for maintaining health and safety at the workplace. • Explain the meaning of hazard, different types of health and safety hazards found in the workplace, risks and threats based on the nature of work. • Explain the relevant signage, warnings, labels or descriptions on equipment, etc. while carrying out 	<ul style="list-style-type: none"> • Demonstrate how to record/document tasks completed as per the requirements within specific timelines. • Show how to analyse problems accurately and communicate different possible solutions to the problem. • Demonstrate how to report any identified breaches in health, safety, and security policies and procedures to the designated person. • Demonstrate the process of using safety materials such as goggles, gloves, earplugs, caps, ESD pins, covers, shoes, etc. • Demonstrate the process of handling heavy and hazardous materials with care, while maintaining appropriate posture. • Demonstrate the process of carrying out routine cleaning of tools, machines and equipment. • Demonstrate ways to optimise the use of electricity/energy in various tasks/activities/processes. • Demonstrate the process of performing periodic checks of the functioning of the equipment/machine and rectify wherever required.

<p>work activities.</p> <ul style="list-style-type: none"> • Describe the procedures to report breaches in health, safety and security. • Describe the organisation's procedures for different emergency situations and the importance of following the same. • Describe different methods of cleaning, disinfection, sterilisation, and sanitisation. • Explain the significance of personal hygiene practice including hand hygiene. • Explain the path of disease transmission. • Describe the correct method of donning and doffing of PPE. • Explain different ways of managing resources and material efficiently. • Explain common electrical problems and common practices of conserving electricity. • Explain categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics and use of different colours of dustbins. • Describe the organisation's procedures for minimising waste. • Explain waste management and methods of waste disposal. • State common sources of pollution and ways to minimise it. 	<ul style="list-style-type: none"> • Demonstrate ways to use electrical equipment and appliances properly • Demonstrate the process of disposing non-recyclable and hazardous waste as per recommended processes.
Classroom Aids:	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Relevant stationery, First Aid Kit and Equipment used in Medical Emergencies.	

Module 5: Process of interacting effectively with team members and customers

Mapped to TEL/N9102 v1.0

Terminal Outcomes:

- Explain the importance of interacting effectively with superiors, colleagues and customers.
- Explain the need of respecting differences of gender and ability.

Duration: 16:00	Duration: 24:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain the organisation's policies on dress code, workplace timings, workplace behaviour, performance management, incentives, delivery standards, information security, etc. • Explain the organisation's hierarchy and escalation matrix • Explain the importance of effective and different means of communication and establishing good working relationships with colleagues and superiors. • Explain the importance of helping colleagues with problems, in order to meet quality and time standards as a team. • Describe different means and methods of communication. • State different types of information that colleagues might need and the importance of providing this information in an appropriate manner. • Describe the organization's policies and procedures for working with colleagues and superiors. • Explain the importance of understanding the consequences of gender based behaviour. • Describe gender based concepts, issues and legislation • State the organization standards and guidelines to be followed for PwD and knowledge about laws, acts and provisions defined for PwD by the 	<ul style="list-style-type: none"> • Demonstrate ways to communicate professionally using different techniques such as face-to-face, telephonic and written means. • Demonstrate appropriate verbal and non-verbal communication while interacting with People with Disability (PwD).

<p>statutory bodies and the right way to use them including various medical conditions associated with PwD</p> <ul style="list-style-type: none"> • Explain the health and safety requirements at a workplace for PwD. • Describe the process of recruiting people for a particular job profile w.r.t PwD and gender. • Explain various government / private schemes and benefits available for PwD and information about various institutes working for PwD to enable in providing livelihood opportunities for PwD. 	
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>Personal Protective Equipment, Hygiene Equipment and Materials like Sanitizer, Soap, Mask, etc.</p>	

Module 6: Process of assisting in creating smart cities by implementing Internet of Things (IoT) solutions

Mapped to TEL/N6254 v1.0

Terminal Outcomes:

- Demonstrate the process of assisting in the implementation of smart lighting and smart parking solutions.
- Demonstrate the process of assisting in the implementation of smart traffic and smart waste management solutions.
- Demonstrate the process of assisting in the implementation of smart utility solutions.
- Demonstrate the process of assisting in the implementation of smart air quality monitoring solutions.

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain the concept of a smart city. • Explain the functioning of a variety of IoT devices used for creating smart cities, such as sensors, meters, lights, etc. • Explain the benefits of smart city solutions, such as public safety, efficient traffic, management, effective management of environmental issues, etc. • List various solutions used to improve infrastructure, public utilities and services under smart city projects. • Describe the process of collecting data using IoT devices and analysing it. • Explain the benefits and functioning of smart lights. • Explain the use of smart parking spaces and relevant smartphone applications. • Explain the use of appropriate IoT devices and CCTVs for smart traffic management. • Explain the benefits and functioning of smart waste bins. • Explain how automatic route optimisation is carried out for waste collection vehicles based on notifications received from smart 	<ul style="list-style-type: none"> • Demonstrate the use of sensor-based automated lighting systems to automate the switching on and off of lights according to the need and save energy. • Demonstrate the use of the appropriate smartphone app configured to read the information transmitted by the sensors installed in parking lots regarding the availability of parking spaces. • Show how to identify the available parking spaces using the relevant smartphone app and provide real-time information to commuters. • Demonstrate the use of sensors and CCTV cameras to regulate vehicular and pedestrian traffic automatically to prevent congestion on roads. • Show how to use the smart waste bins installed with sensors to determine if they are full remotely. • Demonstrate the use of smart grid solutions to allow consumers to store energy during the off-peak hours and lower the stress on the grid during peak hours. • Demonstrate the process of installing smart meters in the buildings and connecting to the smart energy grid. • Show how to track and manage the

<p>waste bins.</p> <ul style="list-style-type: none"> • Explain the smart grid and utility solutions that allow consumers to harvest solar and manage it efficiently. • List the common issues with air quality and the recommended measures to improve it. 	<p>energy flow effectively using smart meters.</p> <ul style="list-style-type: none"> • Demonstrate the use of smart air quality monitors to monitor the Air Quality Index (AQI) and Indoor Quality Index (IQA).
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>Sensor-Based Automated Lights, CCTV Cameras, Smart Meters, Air Quality Monitor Sensors</p>	

Module 7: Process of using Internet of Things (IoT) technology in agriculture

Mapped to TEL/N6255 v1.0

Terminal Outcomes:

- Describe the process of preparing to use the IoT technology.
- Describe the process of collecting the relevant data.
- Demonstrate the process of analysing and utilising the collected data.

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain how IoT works, its application and various benefits in different industries. • Explain the concept of smart farming involving the use of IoT through sensing, automation and analytics technology. • Explain different types of data recorded from agricultural fields, such as soil properties and topography, distribution of irrigation water, moisture levels, crop yield, etc. • Explain the benefits and process of geo-referencing in agriculture. • Describe the process of data transfer from the remote sensors and field. • Describe the process of using IoT how to identify the impacts of adverse weather on agricultural production, and plan the production accordingly. • Explain the benefit and process of making appropriate decisions based on the data recorded from agricultural fields. 	<ul style="list-style-type: none"> • Demonstrate the process of installing and calibrating the relevant sensor-based systems and field data recorders at appropriate locations to monitor crops, soil, irrigation, livestock, storage facilities, etc. • Show how to attach the GPS receivers and smart sensors to the farm machineries such as tractors and harvesters to monitor their movement and guide them. • Demonstrate the process of setting up the relevant mobile application and computer software for data collection and analysis. • Show how to monitor the farm conditions and infrastructure remotely with the help of smart sensors and field data recorders installed in the field. • Demonstrate the use of a variety of sensors to record different types of data, such as soil properties and topography, distribution of irrigation water, moisture levels, crop yield, etc. • Demonstrate how to record geo-referenced data with the use of GPS receivers mounted on the farm machineries. • Demonstrate the use of yield monitors to collect yield data for developing a yield map to identify the areas of productivity in the field. • Demonstrate the process of carrying

	<p>out 3-Dimensional (3D) analysis of the field using GPS and GIS-based sensors, along with drones and satellite imagery.</p> <ul style="list-style-type: none"> • Show how to use sensors and remote sensing technology for creating maps and transferring data from the field to the appropriate software via integrated electronic communications. • Show how to retrieve the data recorded in the field with respect to various agricultural operations using the appropriate devices connected to the IoT system. • Demonstrate the process of carrying out data analysis to gain insights into agricultural production processes and use the insights to make appropriate decisions for improving agricultural operations. • Demonstrate how to develop and analyse computer-based images to research soils, fertilisers, pests, and other agricultural elements. • Show how to use advanced data analytics services to assess the impact of adverse weather conditions on the field and plan agricultural production accordingly. • Show how to analyse the crop scouting data to be used for regulating the use of fertilisers and pesticides in the field. • Show how to use the data analysis to identify and mitigate the adverse impacts of agricultural activities on the environment. • Prepare sample relevant reports in graphical or tabular form, summarising field productivity and profitability.
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>Weather Sensors, GPS Receiver, GIS (Geographic Information System) based Sensors.</p>	

Module 8: Process of using Internet of Things (IoT) technology in Telemedicine

Mapped to TEL/N6256 v1.0

Terminal Outcomes:

- Explain the importance of assisting patients in using wearables.
- Describe the process of assisting in the delivery of telemedicine services.

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain the application and benefits of using IoT for the delivery of telemedicine services. • Explain how mobile communication integrates with IoT remote sensing technology. • Explain the importance of adopting strong network security features in telemedicine for end-to-end encryption of a patient’s sensitive PHI. • State the appropriate measures to be taken to ensure access to sensitive PHI only by the authorised personnel. • Explain the benefits of remote vitals monitoring and the appropriate capabilities required for the purpose. • Explain the use of biometric data recording wearables, such as a pulsometer to record the heart rate or a blood pressure monitor to record the blood pressure. • Describe the process of remotely monitoring a patient’s condition with the use of appropriate IoT devices and systems. • State the appropriate practices to be followed and IoT technology to be used to ensure the security of patients’ Personal Health Information (PHI). • Explain the benefit of using bio-sensors adaptable for use with home-utilised items, such a water glasses and utensils. • Explain the use of non-invasive sensors to gather information about 	<ul style="list-style-type: none"> • Show how to assist the patients via remote assistance in using wearables biosensors and other medical devices to check their blood pressure, temperature, heart rate, etc. • Show how to assist the patient in the use of appropriate mobile phone application that can extract the data transmitted by biosensors and present it in an interpretable format. • Show how to assist the doctors in monitoring the patients remotely using the applicable IoT devices to prescribe appropriate treatment. • Demonstrate the process of monitoring the patient's vital signs, such as temperature, blood pressure, heart rate and other attributes, with the help of bio-sensors placed in their home. • Demonstrate the process of evaluating the EHRs to compare test results, review patient history, and make thorough assessments. • Demonstrate how to process and evaluate the patient’s physiological data transmitted by wearables to the cloud server. • Demonstrate the process of detecting specific disorders, diseases and health conditions with the use of appropriate IoT devices.

<p>the patient's daily activities while they follow their day-to-day routine.</p> <ul style="list-style-type: none"> • Explain the use of a toilet seat sensor capable of tracking blood pressure, stroke volume, blood oxygenation as part of a cardiovascular monitoring system. • Explain the use of a disease-detecting precision health toilet to investigate multiple signs of illness through automated urine and stool analysis. • Explain the use of a smart brush for oral hygiene and other health-based diagnostics based on samples taken from a person's mouth. • Explain the use of a smart bathroom mat and a smart sole in home slippers to determine the weight of a person and also detect movement disorders or musculoskeletal injuries. • Explain the use of a smart bed to track sleeping muscle movement patterns to predict a patient's health. • Explain the use of a health chair to sense the heart rate, respiratory rate and monitor a person's vitals. • State the appropriate hardware and software required to provide computer vision or user interface between the user and service provider in telemedicine. • Explain the importance and benefits of remotely monitoring the health of immuno-compromised patients with chronic health conditions, such as diabetes, cardiovascular disease, and asthma, on an ongoing basis using IoT technology. 	
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>Wearables Bio-Sensors, Smart Bed, IoT Devices Like Monitoring Chair, Health Chart Screens, Sensor-based Medical Devices – Blood Pressure Monitoring Devices, Heart-rate Monitoring Devices.</p>	

Module 9: Process of using Internet of Things (IoT) technology in Transport

Mapped to TEL/N6257 v1.0

Terminal Outcomes:

- Demonstrate the process of using IoT to track and manage vehicles.
- Demonstrate the process of using RFID for toll and fare collection.

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain various applications and benefits of IoT in the transport sector. • Explain how mobile communication integrates with IoT remote sensing technology. • Explain the benefit of using 5G network connectivity with IoT based system, such as the real-time collection of data with minimal latency. • Explain the importance of installing RFID readers at appropriate spots at toll collection booths to facilitate the easy and efficient reading of RFID tags installed on vehicles. • Explain the importance of ensuring reliable power supply to IoT based devices and systems. • Describe the process of collecting toll automatically with the help of RFID tags and readers. • Explain the importance of analysing the data reports generated by the IoT systems to ensure the data is accurate and has no anomalies. • State the mechanism that allows an odometer on transport vehicles to collect data concerning the revolution of wheels. • Explain the benefit of using sensors on transport vehicles to monitor and ensure the correct load on them. • Explain various benefits of using IoT based vehicle tracking system, such as the ability to monitor vehicle/ fleet route, trip duration, idling, speeding, 	<ul style="list-style-type: none"> • Demonstrate how to track the vehicle/ fleet route, trip duration, idling, speeding, harsh cornering, acceleration and braking using the IoT based vehicle tracking system. • Show how to use sensors and actuators connected with the appropriate IoT system to perform appropriate vehicle functions automatically, such as emergency auto brakes. • Demonstrate the process of collecting and analysing data concerning fuel consumption on vehicles using the relevant IoT based system. • Demonstrate the process of conducting appropriate tests to ensure RFID readers are able to read data from RFID tags and toll is collected without any issues through wireless communication with the relevant systems. • Show how to analyse the toll collection reports generated by the toll collection system to ensure the data is accurate and has no anomalies.

<p>harsh cornering, acceleration and braking.</p> <ul style="list-style-type: none"> • Explain the benefit of using sensors and actuators connected with the IoT system for automating certain vehicle functions. • Describe the process of collecting and analysing data concerning fuel consumption on vehicles using the relevant IoT based system. 	
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>Radio Frequency Identification (RFID) Tags, RFID Reader, Sensors & Actuators to control Vehicle functions, Data Monitoring Devices.</p>	

Module 10: On-the-Job Training

Mapped to IoT Technical Service Operator

Mandatory Duration: 120:00	Recommended Duration: 00:00
Location: On-Site	
<p>Terminal Outcomes</p> <ol style="list-style-type: none"> 1. Explain the functioning of cloud computing platforms, such as AWS, Azure, GCP, etc. 2. Explain the basics of C, Embedded C, C++, Arduino. 3. Carry out troubleshooting of electronic circuits using electronic simulation software. 4. Examine the sensors and transducers to identify faults with them and carry out appropriate troubleshooting. 5. Prepare a backup of relevant data on the cloud network and/or the relevant storage media as per the organisational policy. 6. Use the packet analysis tool to pick up data packets and debug them. 7. Carry out debugging, or appropriate troubleshooting based on the checks performed to restore network connectivity. 8. Perform the assigned troubleshooting tasks within the Service Level Agreement (SLA) following the organisational processes. 9. Check the IoT asset connectivity during deployments and assist with performing appropriate troubleshooting. 10. Upgrade IoT devices and peripherals at client premises. 11. Record/document tasks completed as per the requirements within specific timelines. 12. Handle heavy and hazardous materials with care, while maintaining appropriate posture. 13. Carry out routine cleaning of tools, machines and equipment. 14. Dispose non-recyclable and hazardous waste as per recommended processes. 	

Module 11: On-the-Job Training (IoT - Smart City)

Mapped to TEL/N6254 v1.0

Mandatory Duration: 30:00	Recommended Duration: 00:00
Location: On-Site	
Terminal Outcomes <ol style="list-style-type: none">1. Explain the concept of a smart city.2. Explain the functioning of a variety of IoT devices used for creating smart cities, such as sensors, meters, lights, etc.3. Use the sensor-based automated lighting systems to automate the switching on and off of lights according to the need and save energy.4. Use the appropriate smartphone app configured to read the information transmitted by the sensors installed in parking lots regarding the availability of parking spaces.5. Install smart meters in the buildings and connect to the smart energy grid.6. Track and manage the energy flow effectively using smart meters.	

Module 12: On-the-Job Training (IoT – Agriculture)

Mapped to TEL/N6255 v1.0

Mandatory Duration: 30:00	Recommended Duration: 00:00
Location: On-Site	
<p>Terminal Outcomes</p> <ol style="list-style-type: none"> 1. Explain the application and benefits of using IoT for the delivery of agriculture services. 2. Install and calibrate the relevant sensor-based systems and field data recorders at appropriate locations to monitor crops, soil, irrigation, livestock, storage facilities, etc. 3. Set up the relevant mobile application and computer software for data collection and analysis. 4. Record geo-referenced data with the use of GPS receivers mounted on the farm machineries. 5. Develop and analyse computer-based images to research soils, fertilisers, pests, and other agricultural elements. 6. Use the data analysis to identify and mitigate the adverse impacts of agricultural activities on the environment. 7. Prepare sample relevant reports in graphical or tabular form, summarising field productivity and profitability. 	

Module 13: On-the-Job Training (IoT – Telemedicine)

Mapped to TEL/N6256 v1.0

Mandatory Duration: 30:00	Recommended Duration: 00:00
Location: On-Site	
Terminal Outcomes <ol style="list-style-type: none">1. Explain the application and benefits of using IoT for the delivery of telemedicine services.2. Assist the patients via remote assistance in using wearables biosensors and other medical devices to check their blood pressure, temperature, heart rate, etc.3. Assist the doctors in monitoring the patients remotely using the applicable IoT devices to prescribe appropriate treatment.4. Evaluate the patient’s physiological data transmitted by wearables to the cloud server.5. Detect specific disorders, diseases and health conditions with the use of appropriate IoT devices.	

Module 14: On-the-Job Training (IoT – Transport)

Mapped to TEL/N6257 v1.0

Mandatory Duration: 30:00	Recommended Duration: 00:00
Location: On-Site	
Terminal Outcomes <ol style="list-style-type: none">1. Explain various applications and benefits of IoT in the transport sector.2. Collect and analyse data concerning fuel consumption on vehicles using the relevant IoT based system.3. Conduct appropriate tests to ensure RFID readers are able to read data from RFID tags and toll is collected without any issues through wireless communication with the relevant systems.4. Analyse the toll collection reports generated by the toll collection system.	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma after 10 th Class	Science/Electronics/ Telecom/IT and other related domains	4	Active Networks/IoT Domain	0	NA	Eligible for ToT program
Graduate	Science/Electronics /Telecom/IT and other relevant domains	1	Active Networks/IoT Domain	0	NA	Eligible for ToT program

Trainer Certification	
Domain Certification	Platform Certification
Job Role “IoT Technical Service Operator”, “TEL/Q6214, v1.0”, Minimum accepted score is 80%	Job Role: “Trainer”, “MEP/Q2601, v1.0”. Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma after 10th Class	Science/Electronics /Telecom/IT and other related domains	4	Active Networks/IoT Domain	0	NA	Eligible for ToA program
Graduate	Science/Electronics /Telecom/IT and other relevant domains	1	Active Networks/IoT Domain	0	NA	Eligible for ToA program

Assessor Certification	
Domain Certification	Platform Certification
Job Role “ IoT Technical Service Operator ”, “TEL/Q6214, v1.0”, Minimum accepted score is 80%	Job Role: “ Assessor ”, “MEP/Q2701 v1.0”, Minimum Accepted score is 80%

Assessment Strategy

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDSM/SIP or email.
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC.
- The assessment agency deploys the ToA certified Assessor for executing the assessment.
- SSC monitors the assessment process & records.

2. Testing Environment:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIP.
- Check the duration of the training.
- Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
- If the batch size is more than 30, then there should be 2 Assessors.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME).
- Question papers created by the SME verified by the other subject Matter Experts.
- Questions are mapped with NOS and PC.
- Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management.
- An assessor must be ToA certified & the trainer must be ToT Certified.
- The assessment agency must follow the assessment guidelines to conduct the assessment.

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location.
- Center photographs with signboards and scheme-specific branding.
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period.
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos.

5. Method of verification or validation:

- A surprise visit to the assessment location.
- A random audit of the batch.
- A random audit of any candidate.

6. Method for assessment documentation, archiving, and access:

- Hard copies of the documents are stored.
- Soft copies of the documents & photographs of the assessment are uploaded / accessed from cloud Storage.
- Soft copies of the documents & photographs of the assessment are stored in the Hard Drives.

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	The key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on-site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on-site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	The terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.