IoT Technical Service Operator

Electives: IoT - Smart City/ IoT - Agriculture/ IoT - Telemedicine/ IoT - Transport

QP Code: TEL/Q6214

Version: 1.0

NSQF Level: 3

Telecom Sector Skill Council || 3rd Floor, Plot No 126, Sector - 44
Gurgaon - 122003

Contents

TEL/Q6214: IoT Technical Service Operator

Brief Job Description

An IoT Technical Service Operator is responsible for providing technical support concerning the Internet of Things (IoT) systems, including diagnosing and rectifying faults in them. The individual attends to the client queries and provides appropriate solutions following the organisational standards.

Personal Attributes

The individual must be physically fit to work for long durations. The person must have analytical and problem-solving skills with the ability to work in coordination with others. The individual should have good verbal and written communication skills.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. TEL/N6252: Carry out Troubleshooting for IoT Devices and Connectivity Issues

2. TEL/N6253: Assist in Providing IoT Solutions to Clients

3. TEL/N9101: Organise Work and Resources as per Health and Safety Standards

4. TEL/N9102: Interact Effectively with Team Members and Customers

Electives(mandatory to select at least one):

Elective 1: IoT - Smart City

The OS unit is about assisting in implementing various IoT solutions for creating automated or smart cities.

1. TEL/N6254: Assist in Creating Smart Cities by Implementing Internet of Things (IoT) Solutions

Elective 2: IoT - Agriculture

The OS unit is about use of Internet of Things (IoT) Technology in Agriculture.

1. TEL/N6255: Use Internet of Things (IoT) Technology in Agriculture

Elective 3: IoT - Telemedicine

This OS unit is about using Internet of Things (IoT) Technology in Telemedicine.

1. TEL/N6256: Use Internet of Things (IoT) Technology in Telemedicine

Elective 4: IoT - Transport

This OS unit is about use of IoT Technology in Transport

1. TEL/N6257: Use Internet of Things (IoT) Technology in Transport

Qualification Pack (QP) Parameters

Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3114.6214
Minimum Educational Qualification & Experience	10th Class OR 8th Class (and pursuing continuous regular schooling) OR 8th Class (+ ITI (2 years in Electronics/Telecom/IT and other relevant fields))
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	15 Years
Last Reviewed On	NA
Next Review Date	30/06/2025
NSQC Approval Date	30/06/2022
Version	1.0
Reference code on NQR	2022/TEL/TSSC/06067
NQR Version	1.0

TEL/N6252: Carry out Troubleshooting for IoT Devices and Connectivity Issues

Description

This OS unit is about carrying out troubleshooting for IoT devices and connectivity issues.

Scope

The scope covers the following :

- Carry out troubleshooting for IoT devices
- Carry out troubleshooting for connectivity issues

Elements and Performance Criteria

Carry out troubleshooting for IoT devices

To be competent, the user/individual on the job must be able to:

PC1. arrange the appropriate tools and equipment for the maintenance of IoT devices

PC2. monitor the deployed IoT assets using the cloud system

PC3. check the power management modules, Radio Frequency (RF), energy and sensing modules for any malfunctioning and carry out troubleshooting accordingly

PC4. monitor the data infrastructure and assist in maintaining it to ensure uninterrupted internet connectivity to all the deployed IoT assets

PC5. identify issues with different types of microcontrollers through testing and perform troubleshooting or replace the faulty/damaged microcontrollers with correct equipment

PC6. check for uninterrupted communication between RF modules and Wi-Fi, Bluetooth, transceiver, duplexer, etc.

PC7. carry out troubleshooting of electronic circuits using electronic simulation software

PC8. examine the sensors and transducers to identify faults with them and carry out appropriate troubleshooting

PC9. identify issues with Integrated Circuit (ICs) on microcontrollers and repair or replace them, as appropriate

PC10. check the functioning of 3G/4G/5G connectivity modules on the IoT devices

PC11. test data transfer from the IoT device to the cloud server

PC12. identify and troubleshoot issues with digital circuits

PC13. assist in maintaining a variety of communications infrastructures, such as fibre optic, coaxial, Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP) and other types of cable systems

PC14. test various types of network cables to identify issues with them and take appropriate remedial action

PC15. maintain the backup of relevant data on the cloud network and/or the relevant storage media as per the organisational policy

Carry out troubleshooting for connectivity issues

To be competent, the user/individual on the job must be able to:

PC16. test the routing in the network by checking if the IoT device is connected and ensure no issue in the connectivity link

PC17. use the packet analysis tool to pick up data packets and debug them

PC18. check if the IoT device is able to send a DHCP packet with a response from the server

PC19. check if the configuration parameters are correct

PC20. check the connection between IoT devices and cloud controller

PC21. use the remote mirroring feature to mirror the traffic from an IoT device on a remote device

PC22. carry out debugging or appropriate troubleshooting based on the checks performed to restore network connectivity

PC23. perform the assigned troubleshooting tasks within the Service Level Agreement (SLA) following the organisational processes

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the process of diagnosing and resolving common and complex IoT device-related issues

KU2. 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)

KU3. the functioning of a Command Line Interface (CLI)

KU4. the functioning of cloud computing platforms, such as AWS, Azure, GCP, etc.

KU5. the process of analysing complex data, performing data visualisations and extracting meaningful insights

KU6. different scripting languages, such as BASH, Python or JavaScript

KU7. the process of debugging web applications using developer tools

KU8. the benefits of using Structured Query Language (SQL) in Relational Database Management Systems to handle structured data

KU9. the functioning of different types of microcontrollers/processors

KU10. the basics of C, Embedded C, C++, Arduino

KU11. the fundamentals of digital electronics

KU12. different types of communication protocols, such as SPI, I2C, UART, Modbus TCP-IP, etc.

KU13. the process of monitoring the deployed IoT assets using the cloud system

KU14. the process of checking the power management modules, Radio Frequency (RF), energy and sensing modules for any malfunctioning and carrying out troubleshooting

KU15. the process of monitoring the data infrastructure and maintaining it

KU16. common issues experienced with different types of microcontrollers and how to resolve them

KU17. the process of testing microcontrollers

KU18. the importance and process of checking for uninterrupted communication between RF modules and Wi-Fi, Bluetooth, transceiver, duplexer, etc.

KU19. the process of carrying out troubleshooting of electronic circuits using electronic simulation software

KU20. he process of examining sensors and transducers to identify faults with them and appropriate troubleshooting to be carried out

KU21. common issues experienced with Integrated Circuit (ICs) on microcontrollers how to resolve them

KU22. the process of checking the functioning of 3G/ 4G/ 5G connectivity modules on the IoT devices

KU23. the process of testing data transfer from the IoT device to the cloud server

KU24. the process of identifying and troubleshooting issues with digital circuits

KU25. the process of maintaining a variety of communications infrastructures, such as fibre optic, coaxial, Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP) and other types of cable systems

KU26. the process of testing various types of network cables to identify issues with them and taking appropriate remedial action

KU27. the importance and process of maintaining the backup of relevant data on the cloud network and/or the relevant storage media

KU28. the process of testing the routing in the network by checking if the IoT device is connected and the link is up

KU29. the process of using the packet analysis tool to pick up data packets and debugging them

KU30. the process of checking if the IoT device is able to send a DHCP packet with a response from the server

KU31. the importance and process of checking if the configuration parameters are correct

KU32. the process of checking if the IoT device can connect to its cloud controller

KU33. the benefit of using the remote mirroring feature to mirror the traffic from an IoT device on a remote device

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work related notes and records

GS2. read the relevant literature to get the latest updates about the field of work

GS3. listen attentively to understand the information/ instructions being shared

GS4. communicate politely and professionally

GS5. plan and prioritise tasks to ensure timely completion

GS6. co-ordinate with the co-workers to achieve the work objectives

GS7. evaluate all possible solutions to a problem to select the best one

GS8. take quick decisions to deal with workplace emergencies/accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Carry out troubleshooting for IoT devices	**21**	**35**	**-**	**9**
PC1. arrange the appropriate tools and equipment for the maintenance of IoT devices	1	2	-	1
PC2. monitor the deployed IoT assets using the cloud system	1	2	-	1
PC3. check the power management modules, Radio Frequency (RF), energy and sensing modules for any malfunctioning and carry out troubleshooting accordingly	2	3	-	-
PC4. monitor the data infrastructure and assist in maintaining it to ensure uninterrupted internet connectivity to all the deployed IoT assets	1	2	-	1
PC5. identify issues with different types of microcontrollers through testing and perform troubleshooting or replace the faulty/damaged microcontrollers with correct equipment	3	3	-	1
PC6. check for uninterrupted communication between RF modules and Wi-Fi, Bluetooth, transceiver, duplexer, etc.	1	3	-	1
PC7. carry out troubleshooting of electronic circuits using electronic simulation software	1	2	-	-
PC8. examine the sensors and transducers to identify faults with them and carry out appropriate troubleshooting	1	2	-	-
PC9. identify issues with Integrated Circuit (ICs) on microcontrollers and repair or replace them, as appropriate	3	3	-	1
PC10. check the functioning of 3G/4G/5G connectivity modules on the IoT devices	1	2	-	1
PC11. test data transfer from the IoT device to the cloud server	1	2	-	-
PC12. identify and troubleshoot issues with digital circuits	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. assist in maintaining a variety of communications infrastructures, such as fibre optic, coaxial, Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP) and other types of cable systems	2	3	-	-
PC14. test various types of network cables to identify issues with them and take appropriate remedial action	1	2	-	-
PC15. maintain the backup of relevant data on the cloud network and/or the relevant storage media as per the organisational policy	1	2	-	1
Carry out troubleshooting for connectivity issues	**9**	**20**	**-**	**6**
PC16. test the routing in the network by checking if the IoT device is connected and ensure no issue in the connectivity link	1	2	-	1
PC17. use the packet analysis tool to pick up data packets and debug them	1	2	-	1
PC18. check if the IoT device is able to send a DHCP packet with a response from the server	2	3	-	-
PC19. check if the configuration parameters are correct	1	2	-	1
PC20. check the connection between IoT devices and cloud controller	1	3	-	1
PC21. use the remote mirroring feature to mirror the traffic from an IoT device on a remote device	1	2	-	-
PC22. carry out debugging or appropriate troubleshooting based on the checks performed to restore network connectivity	1	3	-	1
PC23. perform the assigned troubleshooting tasks within the Service Level Agreement (SLA) following the organisational processes	1	3	-	1
NOS Total	**30**	**55**	**-**	**15**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6252
NOS Name	Carry out Troubleshooting for IoT Devices and Connectivity Issues
Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N6253: Assist in Providing IoT Solutions to Clients

Description

This OS unit is about assisting in providing IoT solutions to clients at their premises as per the organisation standards.

Scope

The scope covers the following :

- Coordinate client services
- Maintain and review the records

Elements and Performance Criteria

Coordinate client services

To be competent, the user/individual on the job must be able to:

PC1. coordinate with the onsite technical teams for the deployments of IoT assets on client premises, providing the necessary support

PC2. check the IoT asset connectivity during deployments and assist with performing appropriate troubleshooting

PC3. assist in upgrading IoT devices and peripherals at client premises

PC4. assist in ensuring the new IoT applications and devices meet the client needs and address the relevant concerns

PC5. coordinate with the Radio Frequency (RF) engineer to provide switch and RF related support to end users

PC6. coordinate with the internal and external stakeholders to ensure service availability, quality and continuity assurance

PC7. ensure a high level of customer service with a focus on minimum restoration times

PC8. assist customers by answering their queries and resolving issues concerning IoT platforms and products

PC9. coordinate with the supervisor or other relevant personnel to resolve out of authority issues

Maintain and review the records

To be competent, the user/individual on the job must be able to:

PC10. collect the relevant information concerning the assignments received and completed at client premises, ensuring the accuracy of records

PC11. review the records through coordination with the supervisor to identify underlying client issues/concerns and determine their root cause

PC12. identify the appropriate solutions and assist in their implementation to improve the quality of products and services, and client satisfaction

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the importance and process of coordinating with the on-site technical teams for the deployments of IoT assets on client premises

KU2. the process of checking the IoT asset connectivity during deployments and performing appropriate troubleshooting

KU3. the process of upgrading IoT devices and peripherals

KU4. the importance of ensuring the new IoT applications and devices meet the client needs and address the relevant concerns

KU5. the importance and process of coordinating with the Radio Frequency (RF) engineer to provide switch and RF related support to end users

KU6. the importance and process of coordinating with the internal and external stakeholders to ensure service availability, quality and continuity assurance

KU7. the importance of ensuring a high level of customer service with a focus on minimum restoration times

KU8. 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

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work related records

GS2. read the relevant guides and literature to get the latest information about the field of work

GS3. communicate clearly and politely

GS4. listen attentively to understand the instructions

GS5. plan and prioritise tasks to ensure timely completion

GS6. identify appropriate solutions to work related issues

GS7. take quick decision in case of an emergency/accident

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Coordinate client services	**22**	**40**	**-**	**9**
PC1. coordinate with the onsite technical teams for the deployments of IoT assets on client premises, providing the necessary support	3	4	-	1
PC2. check the IoT asset connectivity during deployments and assist with performing appropriate troubleshooting	4	7	-	1
PC3. assist in upgrading IoT devices and peripherals at client premises	2	4	-	1
PC4. assist in ensuring the new IoT applications and devices meet the client needs and address the relevant concerns	2	4	-	1
PC5. coordinate with the Radio Frequency (RF) engineer to provide switch and RF related support to end users	2	4	-	1
PC6. coordinate with the internal and external stakeholders to ensure service availability, quality and continuity assurance	2	5	-	1
PC7. ensure a high level of customer service with a focus on minimum restoration times	3	5	-	1
PC8. assist customers by answering their queries and resolving issues concerning IoT platforms and products	2	4	-	1
PC9. coordinate with the supervisor or other relevant personnel to resolve out of authority issues	2	3	-	1
Maintain and review the records	**8**	**20**	**-**	**1**
PC10. collect the relevant information concerning the assignments received and completed at client premises, ensuring the accuracy of records	2	6	-	1
PC11. review the records through coordination with the supervisor to identify underlying client issues/concerns and determine their root cause	3	6	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. identify the appropriate solutions and assist in their implementation to improve the quality of products and services, and client satisfaction	3	8	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6253
NOS Name	Assist in Providing IoT Solutions to Clients
Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N9101: Organise Work and Resources as per Health and Safety Standards

Description

This OS unit is about planning work and following sustainable as well as healthy practices for safety and optimal use of resources.

Scope

The scope covers the following :

- Perform work as per quality standards
- Maintain safe, healthy and secure working environment
- Conserve material/energy/electricity
- Use effective waste management/recycling practices

Elements and Performance Criteria

Perform work as per quality standards

To be competent, the user/individual on the job must be able to:

PC1. keep workspace clean and tidy

PC2. perform individual role and responsibilities as per the job role while taking accountability for the work

PC3. record/document tasks completed as per the requirements within specific timelines

PC4. implement schedules to ensure timely completion of tasks

PC5. identify the cause of a problem related to own work and validate it

PC6. analyse problems accurately and communicate different possible solutions to the problem

Maintain safe, healthy and secure working environment

To be competent, the user/individual on the job must be able to:

PC7. comply with organisation's current health, safety, security policies and procedures

PC8. check for water spills in and around the work space and escalate these to the appropriate authority

PC9. report any identified breaches in health, safety, and security policies and procedures to the designated person

PC10. use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.

PC11. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence

PC12. identify hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority

PC13. participate regularly in fire drills or other safety related workshops organised by the company

PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected

PC15. maintain appropriate posture while sitting/standing for long hours

PC16. handle heavy and hazardous materials with care, while maintaining appropriate posture

PC17. sanitize workstation and equipment regularly

PC18. clean hands with soap, alcohol-based sanitizer regularly

PC19. avoid contact with anyone suffering from communicable diseases and take necessary precautions

PC20. take safety precautions while travelling e.g. maintain 1m distance from others, sanitize hands regularly, wear masks, etc.

PC21. report hygiene and sanitation issues to appropriate authority

PC22. follow recommended personal hygiene and sanitation practices, for example, washing/sanitizing hands, covering face with a bent elbow while coughing/sneezing, using PPE, etc.

Conserve material/energy/electricity

To be competent, the user/individual on the job must be able to:

PC23. optimize usage of material including water in various tasks/activities/processes

PC24. use resources such as water, electricity and others responsibly

PC25. carry out routine cleaning of tools, machine and equipment

PC26. optimize use of electricity/energy in various tasks/activities/processes

PC27. perform periodic checks of the functioning of the equipment/machine and rectify wherever required

PC28. report malfunctioning and lapses in maintenance of equipment

PC29. use electrical equipment and appliances properly

Use effective waste management/recycling practices

To be competent, the user/individual on the job must be able to:

PC30. identify recyclable, non-recyclable and hazardous waste

PC31. deposit recyclable and reusable material at identified location

PC32. dispose non-recyclable and hazardous waste as per recommended processes

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. 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 an advancement in their skills

KU2. key performance indicators for the new tasks

KU3. feedback processes and formats

KU4. timelines and goals as well as their relevance to work allocated

KU5. importance of quality and timely delivery of the product/service

KU6. escalation matrix and its importance, especially in case of emergencies

KU7. ways of time and cost management

KU8. rules/regulation for maintaining health and safety at workplace

KU9. meaning of hazard, different types of health and safety hazards found in the workplace, risks and threats based on the nature of work

KU10. relevant signage, warnings, labels or descriptions on equipment, etc. while carrying out work activities

KU11. procedures to report breaches in health, safety and security

KU12. organisation's procedures for different emergency situations and the importance of following the same

KU13. different methods of cleaning, disinfection, sterilization, and sanitization

KU14. significance of personal hygiene practice including hand hygiene

KU15. path of disease transmission

KU16. correct method of donning and doffing of PPE

KU17. ways of managing resources and material efficiently

KU18. common electrical problems and common practices of conserving electricity

KU19. categorization of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics and use of different colours of dustbins

KU20. organisation's procedures for minimizing waste

KU21. waste management and methods of waste disposal

KU22. common sources of pollution and ways to minimize it

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. improve and modify work practices

GS2. complete tasks efficiently and accurately within stipulated time

GS3. develop skills and mastery of the technologies prevalent in the industry

GS4. write in at least one language and complete written work with attention to detail

GS5. utilize time and manage workload efficiently

GS6. read and comprehend instructions and documents

GS7. accept feedback in a constructive way

GS8. seek clarifications from superior about the job requirement

GS9. read and comprehend statutory documents relevant to safety and hygiene

GS10. refer all anomalies to the concerned persons

GS11. analyze situations and make appropriate decisions

GS12. decide the most suitable course of action for completing the task within resources

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform work as per quality standards	**4**	**9**	**-**	**2**
PC1. keep workspace clean and tidy	-	1	-	-
PC2. perform individual role and responsibilities as per the job role while taking accountability for the work	1	1	-	1
PC3. record/document tasks completed as per the requirements within specific timelines	-	1	-	1
PC4. implement schedules to ensure timely completion of tasks	-	2	-	-
PC5. identify the cause of a problem related to own work and validate it	2	2	-	-
PC6. analyse problems accurately and communicate different possible solutions to the problem	1	2	-	-
Maintain safe, healthy and secure working environment	**16**	**27**	**-**	**4**
PC7. comply with organisation's current health, safety, security policies and procedures	1	1	-	-
PC8. check for water spills in and around the work space and escalate these to the appropriate authority	1	2	-	1
PC9. report any identified breaches in health, safety, and security policies and procedures to the designated person	1	2	-	1
PC10. use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.	1	2	-	1
PC11. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence	2	3	-	1
PC12. identify hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority	2	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. participate regularly in fire drills or other safety related workshops organised by the company	1	3	-	-
PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected	1	3	-	-
PC15. maintain appropriate posture while sitting/standing for long hours	1	1	-	-
PC16. handle heavy and hazardous materials with care, while maintaining appropriate posture	1	1	-	-
PC17. sanitize workstation and equipment regularly	1	2	-	-
PC18. clean hands with soap, alcohol-based sanitizer regularly	-	1	-	-
PC19. avoid contact with anyone suffering from communicable diseases and take necessary precautions	-	1	-	-
PC20. take safety precautions while travelling e.g. maintain 1m distance from others, sanitize hands regularly, wear masks, etc.	1	2	-	-
PC21. report hygiene and sanitation issues to appropriate authority	1	1	-	-
PC22. follow recommended personal hygiene and sanitation practices, for example, washing/sanitizing hands, covering face with a bent elbow while coughing/sneezing, using PPE, etc.	1	1	-	-
Conserve material/energy/electricity	**7**	**16**	**-**	**3**
PC23. optimize usage of material including water in various tasks/activities/processes	1	2	-	-
PC24. use resources such as water, electricity and others responsibly	1	2	-	1
PC25. carry out routine cleaning of tools, machine and equipment	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. optimize use of electricity/energy in various tasks/activities/processes	1	3	-	1
PC27. perform periodic checks of the functioning of the equipment/machine and rectify wherever required	1	3	-	1
PC28. report malfunctioning and lapses in maintenance of equipment	1	2	-	-
PC29. use electrical equipment and appliances properly	1	2	-	-
Use effective waste management/recycling practices	**3**	**8**	**-**	**1**
PC30. identify recyclable, non-recyclable and hazardous waste	1	2	-	1
PC31. deposit recyclable and reusable material at identified location	1	3	-	-
PC32. dispose non-recyclable and hazardous waste as per recommended processes	1	3	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N9101
NOS Name	Organise Work and Resources as per Health and Safety Standards
Sector	Telecom
Sub-Sector	Generic
Occupation	Generic
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N9102: Interact Effectively with Team Members and Customers

Description

This OS unit is about interacting with superiors and colleagues as well as customers and other stakeholders in own or other work groups within as well as outside the organisation.

Scope

The scope covers the following :

- Interact effectively with superiors
- Interact effectively with colleagues and customers
- Respect differences of gender and ability

Elements and Performance Criteria

Interact effectively with superiors

To be competent, the user/individual on the job must be able to:

PC1. receive work requirements from superiors and customers and interpret them correctly

PC2. inform the supervisor and/or concerned person about any unforeseen disruptions or delays

PC3. participate in decision making by providing facts and figures, giving/accepting constructive suggestions

PC4. rectify errors as per feedback and ensure the errors are not repeated

Interact effectively with colleagues and customers

To be competent, the user/individual on the job must be able to:

PC5. comply with organisation's policies and procedures for working with team members

PC6. communicate professionally using appropriate mode of communication such as face-to-face, telephonic and written

PC7. respond to queries and seek/provide clarifications if required

PC8. co-ordinate with team to integrate work as per requirements

PC9. resolve conflicts within the team/with customers to achieve smooth workflow

PC10. recognize emotions accurately in self and others to build good relationships

PC11. prioritize team and organization goals above personal goals

Respect differences of gender and ability

To be competent, the user/individual on the job must be able to:

PC12. maintain a conducive environment for all the genders at the workplace

PC13. encourage appropriate behavior and conduct with people across gender

PC14. assist team members with disability in overcoming any challenges faced in work

PC15. practice appropriate verbal and non-verbal communication while interacting with People with Disability (PwD)

PC16. ensure equal participation of the people across genders in discussions

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation's policies on dress code, workplace timings, workplace behaviour, performance management, incentives, delivery standards, information security, etc.

KU2. organisation's hierarchy and escalation matrix

KU3. importance of establishing good working relationships with colleagues and superiors

KU4. importance of helping colleagues with problems, in order to meet quality and time standards as a team

KU5. different means and methods of communication

KU6. different types of information that colleagues might need and the importance of providing this information in an appropriate manner

KU7. organisation's policies and procedures for working with colleagues and superiors

KU8. importance of understanding consequences of gender biased behaviour

KU9. gender based concepts, issues and legislation

KU10. organisation standards and guidelines to be followed for PwD and knowledge about laws, acts and provisions defined for PwD by the statutory bodies and the right way to use them including various medical conditions associated with PwD

KU11. health and safety requirements at workplace for PwD

KU12. process of recruiting people for a particular job profile w.r.t PwD and gender

KU13. 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

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and comprehend forms, documents and records

GS2. read and write in English and/or local language

GS3. complete work with attention to detail

GS4. listen effectively and orally communicate information

GS5. work as per customer requirements

GS6. communicate with empathy across genders and PwD

GS7. improve and modify work practices

GS8. maintain positive and effective relationships with colleagues and customers

GS9. evaluate the possible solution(s) to the problem

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Interact effectively with superiors	**7**	**15**	**-**	**2**
PC1. receive work requirements from superiors and customers and interpret them correctly	1	2	-	-
PC2. inform the supervisor and/or concerned person about any unforeseen disruptions or delays	2	4	-	1
PC3. participate in decision making by providing facts and figures, giving/accepting constructive suggestions	2	5	-	1
PC4. rectify errors as per feedback and ensure the errors are not repeated	2	4	-	-
Interact effectively with colleagues and customers	**7**	**26**	**-**	**4**
PC5. comply with organisation's policies and procedures for working with team members	1	2	-	-
PC6. communicate professionally using appropriate mode of communication such as face-to-face, telephonic and written	2	4	-	1
PC7. respond to queries and seek/provide clarifications if required	2	4	-	1
PC8. co-ordinate with team to integrate work as per requirements	-	3	-	-
PC9. resolve conflicts within the team/with customers to achieve smooth workflow	1	5	-	1
PC10. recognize emotions accurately in self and others to build good relationships	1	4	-	-
PC11. prioritize team and organization goals above personal goals	-	4	-	1
Respect differences of gender and ability	**11**	**24**	**-**	**4**
PC12. maintain a conducive environment for all the genders at the workplace	2	5	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. encourage appropriate behavior and conduct with people across gender	2	5	-	1
PC14. assist team members with disability in overcoming any challenges faced in work	3	4	-	1
PC15. practice appropriate verbal and non-verbal communication while interacting with People with Disability (PwD)	2	4	-	1
PC16. ensure equal participation of the people across genders in discussions	2	6	-	-
NOS Total	**25**	**65**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N9102
NOS Name	Interact Effectively with Team Members and Customers
Sector	Telecom
Sub-Sector	Generic
Occupation	Generic
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	31/03/2022
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N6254: Assist in Creating Smart Cities by Implementing Internet of Things (IoT) Solutions

Description

The OS unit is about assisting in implementing various IoT solutions for creating automated or smart cities.

Scope

The scope covers the following :

- Assist in the implementation of smart lighting solutions
- Assist in the implementation of smart parking solutions
- Assist in the implementation of smart traffic management solutions
- Assist in the implementation of smart waste management solutions
- Assist in the implementation of smart utility solutions
- Assist in the implementation of smart air quality monitoring solutions

Elements and Performance Criteria

Assist in the implementation of smart lighting solutions

To be competent, the user/individual on the job must be able to:

PC1. identify the highly frequented spots by the community members

PC2. coordinate with a relevant vendor for the installation of a sensor-based automated lighting system in the identified spots and areas

PC3. use sensor-based automated lighting systems to automate the switching on and off of lights according to the need and save energy

Assist in the implementation of smart parking solutions

To be competent, the user/individual on the job must be able to:

PC4. identify the areas that experience issues with parking space management

PC5. coordinate with a relevant vendor for the installation of sensors at the identified locations to determine when the parking lots are free

PC6. use the appropriate smartphone applications configured to read the information transmitted by the sensors installed in parking lots regarding the availability of parking spaces

PC7. identify the available parking spaces using the relevant smartphone applications and provide real-time information to commuters

Assist in the implementation of smart traffic management solutions

To be competent, the user/individual on the job must be able to:

PC8. identify roads that frequently experience vehicular and pedestrian traffic

PC9. coordinate with the relevant vendor for the installation of sensors and Closed-Circuit Television (CCTV) cameras to monitor the traffic

PC10. regulate the vehicular and pedestrian traffic automatically to prevent congestion

PC11. ensure the use of vehicles fitted with appropriate IoT devices for planning commute and avoiding collision with other vehicles

PC12. ensure the availability of smartphone applications with voice search and location data capabilities for smart transit

Assist in the implementation of smart waste management solutions

To be competent, the user/individual on the job must be able to:

PC13. coordinate with the relevant vendor to get waste collection bins fitted with sensors that send a notification when the bins are full

PC14. use the smart waste bins installed with sensors to determine if they are full remotely

PC15. follow the appropriate measures for the automatic route optimisation of waste collection vehicles

PC16. ensure waste is collected only from those bins that send notification of being full, thus achieving efficiency in waste collection and reducing the time and effort required

Assist in the implementation of smart utility solutions

To be competent, the user/individual on the job must be able to:

PC17. use the smart grid solutions to allow consumers to store energy during the off-peak hours and lower the stress on the grid during peak hours

PC18. install smart meters in the buildings and connect to the smart energy grid

PC19. track and manage the energy flow effectively using the smart meters

Assist in the implementation of smart air quality monitoring solutions

To be competent, the user/individual on the job must be able to:

PC20. identify areas that experience air quality issues, such as excessive pollution and poor air circulation

PC21. coordinate with the relevant vendor for the installation of air quality monitors in the identified areas

PC22. use smart air quality monitors to monitor the Air Quality Index (AQI) and Indoor Quality Index (IQA)

PC23. follow and promote the recommended measures to improve the air quality

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the concept of a smart city

KU2. the functioning of a variety of IoT devices used for creating smart cities, such as sensors, meters, lights, etc.

KU3. the benefits of smart city solutions, such as public safety, efficient traffic, management, effective management of environmental issues, etc

KU4. various solutions used to improve infrastructure, public utilities and services under smart city projects

KU5. the process of collecting data using the IoT devices and analysing it

KU6. the benefits and functioning of smart lights

KU7. the use of smart parking spaces and relevant smartphone applications

KU8. the use of appropriate IoT devices and CCTVs for smart traffic management

KU9. the benefits and functioning of smart waste bins

KU10. how automatic route optimisation is carried out for waste collection vehicles based on notifications received from smart waste bins

KU11. the smart grid and utility solutions that allow consumers to harvest solar and manage it efficiently

KU12. the use of smart air quality monitors to monitor the Air Quality Index (AQI)

KU13. the common issues with air quality and the recommended measures to improve it

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work related notes and records

GS2. read the relevant literature to get the information about the latest developments in the field of work

GS3. communicate clearly and politely

GS4. listen attentively to understand the information/ instructions being shared

GS5. plan and prioritise tasks to ensure timely completion

GS6. evaluate all possible solutions to a problem to select the best one

GS7. identify possible disruptions to work and take appropriate preventive measures

GS8. take quick decisions to deal with workplace emergencies/accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Assist in the implementation of smart lighting solutions	**3**	**7**	**-**	**2**
PC1. identify the highly frequented spots by the community members	1	2	-	1
PC2. coordinate with a relevant vendor for the installation of a sensor-based automated lighting system in the identified spots and areas	1	2	-	-
PC3. use sensor-based automated lighting systems to automate the switching on and off of lights according to the need and save energy	1	3	-	1
Assist in the implementation of smart parking solutions	**4**	**12**	**-**	**2**
PC4. identify the areas that experience issues with parking space management	1	2	-	-
PC5. coordinate with a relevant vendor for the installation of sensors at the identified locations to determine when the parking lots are free	1	3	-	1
PC6. use the appropriate smartphone applications configured to read the information transmitted by the sensors installed in parking lots regarding the availability of parking spaces	1	4	-	-
PC7. identify the available parking spaces using the relevant smartphone applications and provide real-time information to commuters	1	3	-	1
Assist in the implementation of smart traffic management solutions	**5**	**18**	**-**	**2**
PC8. identify roads that frequently experience vehicular and pedestrian traffic	1	4	-	1
PC9. coordinate with the relevant vendor for the installation of sensors and Closed-Circuit Television (CCTV) cameras to monitor the traffic	1	4	-	-
PC10. regulate the vehicular and pedestrian traffic automatically to prevent congestion	1	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. ensure the use of vehicles fitted with appropriate IoT devices for planning commute and avoiding collision with other vehicles	1	4	-	-
PC12. ensure the availability of smartphone applications with voice search and location data capabilities for smart transit	1	3	-	1
Assist in the implementation of smart waste management solutions	**4**	**14**	**-**	**1**
PC13. coordinate with the relevant vendor to get waste collection bins fitted with sensors that send a notification when the bins are full	1	4	-	-
PC14. use the smart waste bins installed with sensors to determine if they are full remotely	1	3	-	-
PC15. follow the appropriate measures for the automatic route optimisation of waste collection vehicles	1	3	-	1
PC16. ensure waste is collected only from those bins that send notification of being full, thus achieving efficiency in waste collection and reducing the time and effort required	1	4	-	-
Assist in the implementation of smart utility solutions	**2**	**7**	**-**	**1**
PC17. use the smart grid solutions to allow consumers to store energy during the off-peak hours and lower the stress on the grid during peak hours	1	2	-	-
PC18. install smart meters in the buildings and connect to the smart energy grid	1	3	-	1
PC19. track and manage the energy flow effectively using the smart meters	-	2	-	-
Assist in the implementation of smart air quality monitoring solutions	**2**	**12**	**-**	**2**
PC20. identify areas that experience air quality issues, such as excessive pollution and poor air circulation	1	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. coordinate with the relevant vendor for the installation of air quality monitors in the identified areas	-	2	-	1
PC22. use smart air quality monitors to monitor the Air Quality Index (AQI) and Indoor Quality Index (IQA)	-	3	-	-
PC23. follow and promote the recommended measures to improve the air quality	1	4	-	1
NOS Total	**20**	**70**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6254
NOS Name	Assist in Creating Smart Cities by Implementing Internet of Things (IoT) Solutions
Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N6255: Use Internet of Things (IoT) Technology in Agriculture

Description

The OS unit is about utilising IoT technology to achieve efficiency in agricultural operations and increase production.

Scope

The scope covers the following :

- Prepare to use the IoT technology
- Collect the relevant data
- Analyze and utilise the collected data

Elements and Performance Criteria

Prepare to use the IoT technology

To be competent, the user/individual on the job must be able to:

PC1.   select the appropriate smart sensor-based systems, field data recording and other relevant devices for use in agricultural operations

PC2.   install and calibrate the relevant sensor-based systems and field data recorders at appropriate locations to monitor crops, soil, irrigation, livestock, storage facilities, etc.

PC3.   attach the GPS receivers and smart sensors to the farm machineries such as tractors and harvesters to monitor their movement and guide them

PC4.   set up the relevant mobile application and computer software for data collection and analysis

Collect the relevant data

To be competent, the user/individual on the job must be able to:

PC5.   monitor the farm conditions and infrastructure remotely with the help of smart sensors and field data recorders installed in the field

PC6.   use 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.

PC7.   record geo-referenced data with the use of GPS receivers mounted on the farm machineries

PC8.   use yield monitors to collect yield data for developing a yield map to identify the areas of productivity in the field

PC9.   carry out 3-Dimensional (3D) analysis of the field using GPS and GIS-based sensors, along with drones and satellite imagery

PC10. use sensors and remote sensing technology for creating maps and transferring data from the field to the appropriate software via integrated electronic communications

Analyse and utilise the collected data

To be competent, the user/individual on the job must be able to:

PC11. retrieve the data recorded in the field with respect to various agricultural operations using the appropriate devices connected to the IoT system

PC12. carry out data analysis to gain insights into agricultural production processes and use the insights to make appropriate decisions for improving agricultural operations

PC13. develop and analyse computer-based images to research soils, fertilisers, pests, and other agricultural elements

PC14. use the advanced data analytics services to assess the impact of adverse weather conditions on the field and plan agricultural production accordingly

PC15. analyse the crop scouting data to be used for regulating the use of fertilisers and pesticides in the field

PC16. use the data analysis to identify and mitigate the adverse impacts of agricultural activities on the environment

PC17. monitor the supply chain in real-time utilising IoT to ensure supply as per the demand

PC18. prepare the relevant reports in graphical or tabular form, summarising field productivity and profitability

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. how IoT works, its application and various benefits in different industries

KU2. the concept of smart farming involving the use of IoT through sensing, automation and analytics technology

KU3. how to install and use a variety of sensors and field data records to record different types of data from agricultural fields

KU4. use of the relevant mobile application or computer software for reading the data recorded by field devices

KU5. different types of data recorded from agricultural fields, such as soil properties and topography, distribution of irrigation water, moisture levels, crop yield, etc.

KU6. the benefits and process of geo-referencing in agriculture

KU7. the process of data transfer from the remote sensors and field

KU8. how to carry out 3D analysis of the field using GPS and GIS-based sensors, along with drones and satellite imagery

KU9. devices using the integrated electronic communications

KU10. how to develop and analyse computer-based images to research soils, fertilisers, pests, and other agricultural elements

KU11. the process of using IoT to how to identify the impacts of adverse weather on agricultural production, and planning the production accordingly

KU12. the benefit and process of making appropriate decisions based on the data recorded from agricultural fields

KU13. the process of preparing the relevant reports with respect to data analysis and drawing appropriate conclusions

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work related notes and records

GS2. communicate clearly and politely with co-workers and clients

GS3. read the relevant literature to get information about the latest developments in the field of work

GS4. plan and prioritise tasks to ensure timely completion

GS5. take quick decisions to deal with workplace emergencies/accidents

GS6. listen attentively to understand the information/instructions

GS7. identify possible disruptions to work and take appropriate preventive measures

GS8. co-ordinate with co-workers to achieve work objectives

GS9. evaluate all possible solutions to a problem to select the best one

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare to use the IoT technology	**6**	**15**	**-**	**4**
PC1. select the appropriate smart sensor-based systems, field data recording and other relevant devices for use in agricultural operations	1	2	-	1
PC2. install and calibrate the relevant sensor-based systems and field data recorders at appropriate locations to monitor crops, soil, irrigation, livestock, storage facilities, etc.	2	5	-	1
PC3. attach the GPS receivers and smart sensors to the farm machineries such as tractors and harvesters to monitor their movement and guide them	1	4	-	1
PC4. set up the relevant mobile application and computer software for data collection and analysis	2	4	-	1
Collect the relevant data	**6**	**16**	**-**	**6**
PC5. monitor the farm conditions and infrastructure remotely with the help of smart sensors and field data recorders installed in the field	1	5	-	1
PC6. use 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.	1	2	-	1
PC7. record geo-referenced data with the use of GPS receivers mounted on the farm machineries	1	3	-	1
PC8. use yield monitors to collect yield data for developing a yield map to identify the areas of productivity in the field	1	2	-	1
PC9. carry out 3-Dimensional (3D) analysis of the field using GPS and GIS-based sensors, along with drones and satellite imagery	1	2	-	1
PC10. use sensors and remote sensing technology for creating maps and transferring data from the field to the appropriate software via integrated electronic communications	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Analyse and utilise the collected data	**13**	**24**	**-**	**10**
PC11. retrieve the data recorded in the field with respect to various agricultural operations using the appropriate devices connected to the IoT system	2	2	-	2
PC12. carry out data analysis to gain insights into agricultural production processes and use the insights to make appropriate decisions for improving agricultural operations	1	2	-	1
PC13. develop and analyse computer-based images to research soils, fertilisers, pests, and other agricultural elements	2	4	-	1
PC14. use the advanced data analytics services to assess the impact of adverse weather conditions on the field and plan agricultural production accordingly	1	2	-	1
PC15. analyse the crop scouting data to be used for regulating the use of fertilisers and pesticides in the field	2	4	-	2
PC16. use the data analysis to identify and mitigate the adverse impacts of agricultural activities on the environment	2	4	-	1
PC17. monitor the supply chain in real-time utilising IoT to ensure supply as per the demand	1	3	-	1
PC18. prepare the relevant reports in graphical or tabular form, summarising field productivity and profitability	2	3	-	1
NOS Total	**25**	**55**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6255
NOS Name	Use Internet of Things (IoT) Technology in Agriculture
Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N6256: Use Internet of Things (IoT) Technology in Telemedicine

Description

The OS unit is about utilising IoT technology to provide telemedicine services.

Scope

The scope covers the following :

- Assist patients in using wearables
- Assist in the delivery of telemedicine services

Elements and Performance Criteria

Assist patients in using wearables

To be competent, the user/individual on the job must be able to:

PC1. assist the patients via remote assistance in using wearables bio-sensors and other medical devices to check their blood pressure, temperature, heart rate, etc.

PC2. ensure the sensing wearables and devices are connected to the relevant cloud services for the safe and successful transmission of the patient vitals for analysis by a doctor

PC3. assist the patient in the use of appropriate mobile phone application that can extract the data transmitted by bio-sensors and present it in an interpretable format

PC4. ensure the recording and transmission of Personal Health Information (PHI) complies with the applicable data security regulations to protect it from unauthorised access and misuse

Assist in the delivery of telemedicine services

To be competent, the user/individual on the job must be able to:

PC5. assist the doctors in monitoring the patients remotely using the applicable IoT devices to prescribe appropriate treatment

PC6. assist in 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

PC7. use the appropriate IoT systems integrated with the Electronic Health Records (EHRs) of the patients

PC8. assist in evaluating the EHRs to compare test results, review patient history, and make thorough assessments

PC9. process and evaluate the patient's physiological data transmitted by wearables to the cloud server

PC10. assist in detecting specific disorders, diseases and health conditions with the use of appropriate IoT devices

PC11. ensure the availability of prescriptions and other relevant data to the patients that can be shared digitally with specialists and pharmacists

PC12. use a high-speed network, such as 5G for secure, reliable and uninterrupted connectivity

PC13. ensure safe transmission and storage of patient's Personal Health Information (PHI) in compliance with the applicable laws using the relevant IoT technology

PC14. use the appropriate systems that provide a user-friendly interface between the patient and telemedicine service provider

PC15. assist in using the relevant clinical decision support system to detect patterns in patient's PHI and identify existing or potential health issues

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the application and benefits of using IoT for the delivery of telemedicine services

KU2. how mobile communication integrates with IoT remote sensing technology

KU3. the importance of adopting strong network security features in telemedicine for end-to-end encryption of a patients sensitive PHI

KU4. the appropriate measures to be taken to ensure access to sensitive PHI only by the authorised personnel

KU5. the benefits of remote vitals monitoring and the appropriate capabilities required for the purpose

KU6. 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

KU7. the process of remotely monitoring a patients condition with the use of appropriate IoT devices and systems

KU8. the integration of data analytics and deep learning for effective data analysis

KU9. the appropriate practices to be followed and IoT technology to be used to ensure the security of patients Personal Health Information (PHI)

KU10. the benefit of using bio-sensors adaptable for use with home-utilised items, such a water glasses and utensils

KU11. the use of non-invasive sensors to gather information about the patient's daily activities while they follow their day-to-day routine

KU12. the use of a toilet seat sensor capable of tracking blood pressure, stroke volume, blood oxygenation as part of a cardiovascular monitoring system

KU13. the use of a disease-detecting precision health toilet to investigate multiple signs of illness through automated urine and stool analysis

KU14. use of a smart brush for oral hygiene and other health-based diagnostics based on samples taken from a person's mouth

KU15. 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

KU16. use of a smart bed to track sleeping muscle movement patterns to predict a patient's health

KU17. use of a health chair to sense the heart rate, respiratory rate and monitor a persons vitals

KU18. the appropriate hardware and software required to provide computer vision or user interface between the user and service provider in telemedicine

KU19. 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 the IoT technology

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work related notes and records

GS2. read the relevant literature to get information about the latest developments in the field of work

GS3. communicate clearly and politely with co-workers and clients

GS4. listen attentively to understand the information/instructions

GS5. plan and prioritise tasks to ensure timely completion

GS6. co-ordinate with co-workers to achieve work objectives

GS7. evaluate all possible solutions to a problem to select the best one

GS8. identify possible disruptions to work and take appropriate preventive measures

GS9. take quick decisions to deal with workplace emergencies/accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Assist patients in using wearables	**11**	**14**	**-**	**3**
PC1. assist the patients via remote assistance in using wearables bio-sensors and other medical devices to check their blood pressure, temperature, heart rate, etc.	3	3	-	1
PC2. ensure the sensing wearables and devices are connected to the relevant cloud services for the safe and successful transmission of the patient vitals for analysis by a doctor	2	4	-	1
PC3. assist the patient in the use of appropriate mobile phone application that can extract the data transmitted by bio-sensors and present it in an interpretable format	3	3	-	-
PC4. ensure the recording and transmission of Personal Health Information (PHI) complies with the applicable data security regulations to protect it from unauthorised access and misuse	3	4	-	1
Assist in the delivery of telemedicine services	**24**	**36**	**-**	**12**
PC5. assist the doctors in monitoring the patients remotely using the applicable IoT devices to prescribe appropriate treatment	3	3	-	1
PC6. assist in 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	3	3	-	1
PC7. use the appropriate IoT systems integrated with the Electronic Health Records (EHRs) of the patients	3	2	-	1
PC8. assist in evaluating the EHRs to compare test results, review patient history, and make thorough assessments	2	3	-	1
PC9. process and evaluate the patient's physiological data transmitted by wearables to the cloud server	3	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. assist in detecting specific disorders, diseases and health conditions with the use of appropriate IoT devices	2	2	-	1
PC11. ensure the availability of prescriptions and other relevant data to the patients that can be shared digitally with specialists and pharmacists	3	4	-	1
PC12. use a high-speed network, such as 5G for secure, reliable and uninterrupted connectivity	2	3	-	1
PC13. ensure safe transmission and storage of patient's Personal Health Information (PHI) in compliance with the applicable laws using the relevant IoT technology	1	5	-	1
PC14. use the appropriate systems that provide a user-friendly interface between the patient and telemedicine service provider	1	4	-	1
PC15. assist in using the relevant clinical decision support system to detect patterns in patient's PHI and identify existing or potential health issues	1	5	-	2
NOS Total	**35**	**50**	**-**	**15**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6256
NOS Name	Use Internet of Things (IoT) Technology in Telemedicine
Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

TEL/N6257: Use Internet of Things (IoT) Technology in Transport

Description

The OS unit is about utilising IoT technology to manage transport and related services efficiently.

Scope

The scope covers the following :

- Use IoT to track and manage vehicles
- Use RFID for toll collection
- Use RFID for fare collection

Elements and Performance Criteria

Use IoT to track and manage vehicles

To be competent, the user/individual on the job must be able to:

PC1. coordinate with the relevant vendor for the installation of the vehicle tracking system on vehicles to track them, ensuring to use 5G network for real-time tracking

PC2. ensure the recommended load on vehicles according to their capacity by monitoring the load with the help of sensors installed on them

PC3. track the vehicle/fleet route, trip duration, idling, speeding, harsh cornering, acceleration and braking using the IoT based vehicle tracking system

PC4. use sensors and actuators connected with the appropriate IoT system to perform appropriate vehicle functions automatically, such as emergency auto brakes

PC5. collect and analyse data concerning fuel consumption on vehicles using the relevant IoT based system

PC6. arrange for regular maintenance of vehicle tracking system and relevant accessories to ensure efficient operations

Use RFID for toll collection

To be competent, the user/individual on the job must be able to:

PC7. identify the appropriate type of RFID tag readers for installation at toll collection booths

PC8. select appropriate spots at toll collection booths for the installation of RFID readers to facilitate the easy and efficient reading of RFID tags installed on vehicles

PC9. coordinate with the relevant vendor for the installation of RFID readers at the identified spots

PC10. ensure the RFID readers are connected securely to a power source and have a stable 5G network connection to communicate with the relevant systems

PC11. 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

PC12. analyse the toll collection reports generated by the toll collection system to ensure the data is accurate and has no anomalies

Use RFID for fare collection

To be competent, the user/individual on the job must be able to:

PC13. coordinate with the relevant vendor for the installation of RFID smart card readers at entry and exit points on public transport vehicles

PC14. ensure the odometer on the transport vehicles are able to collect data concerning the revolution of wheels

PC15. ensure the smart card readers are connected to the odometer on the transport vehicle and can charge passengers' smart cards based on the distance covered by them

PC16. arrange for uninterrupted power supply to smart card readers

PC17. use the 5G network connectivity for reliable and real-time collection of fare collection data

PC18. check the fare collection reports to ensure fare computation and collection data is correct

PC19. coordinate with the smart card reader manufacturer for the identification and resolution of potential issues with smart card readers

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. various applications and benefits of IoT in the transport sector

KU2. how mobile communication integrates with IoT remote sensing technology

KU3. the benefit of using 5G network connectivity with IoT based system, such as the real-time collection of data with minimal latency

KU4. 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

KU5. the importance of ensuring reliable power supply to IoT based devices and systems

KU6. the process of conducting appropriate tests to ensure the correct functioning of IoT devices and systems

KU7. the process of collecting toll automatically with the help of RFID tags and readers

KU8. the importance and process of analysing the data reports generated by the IoT systems to ensure the data is accurate and has no anomalies

KU9. the process of using RFID based smart cards for fare collection in the public transport system

KU10. the mechanism that allows an odometer on transport vehicles to collect data concerning the revolution of wheels

KU11. use IoT to track and manage vehicles

KU12. the benefit of using sensors on transport vehicles to monitor and ensure the correct load on them

KU13. various benefits of using IoT based vehicle tracking system, such as the ability to monitor vehicle/ fleet route, trip duration, idling, speeding, harsh cornering, acceleration and braking

KU14. the benefit of using sensors and actuators connected with the IoT system for automating certain vehicle functions

KU15. the process of collecting and analysing data concerning fuel consumption on vehicles using the relevant IoT based system

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work related notes and records

GS2. read the relevant literature to get information about the latest developments in the field of work

GS3. communicate clearly and politely with co-workers and clients

GS4. listen attentively to understand the information/instructions

GS5. plan and prioritise tasks to ensure timely completion

GS6. co-ordinate with co-workers to achieve work objectives

GS7. evaluate all possible solutions to a problem to select the best one

GS8. identify possible disruptions to work and take appropriate preventive measures

GS9. take quick decisions to deal with workplace emergencies/accidents

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Use IoT to track and manage vehicles	**9**	**17**	**-**	**7**
PC1. coordinate with the relevant vendor for the installation of the vehicle tracking system on vehicles to track them, ensuring to use 5G network for real-time tracking	1	3	-	1
PC2. ensure the recommended load on vehicles according to their capacity by monitoring the load with the help of sensors installed on them	2	3	-	1
PC3. track the vehicle/fleet route, trip duration, idling, speeding, harsh cornering, acceleration and braking using the IoT based vehicle tracking system	2	3	-	2
PC4. use sensors and actuators connected with the appropriate IoT system to perform appropriate vehicle functions automatically, such as emergency auto brakes	1	3	-	1
PC5. collect and analyse data concerning fuel consumption on vehicles using the relevant IoT based system	2	2	-	1
PC6. arrange for regular maintenance of vehicle tracking system and relevant accessories to ensure efficient operations	1	3	-	1
Use RFID for toll collection	**9**	**16**	**-**	**6**
PC7. identify the appropriate type of RFID tag readers for installation at toll collection booths	1	3	-	1
PC8. select appropriate spots at toll collection booths for the installation of RFID readers to facilitate the easy and efficient reading of RFID tags installed on vehicles	2	3	-	1
PC9. coordinate with the relevant vendor for the installation of RFID readers at the identified spots	1	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. ensure the RFID readers are connected securely to a power source and have a stable 5G network connection to communicate with the relevant systems	2	2	-	1
PC11. 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	1	2	-	1
PC12. analyse the toll collection reports generated by the toll collection system to ensure the data is accurate and has no anomalies	2	3	-	1
Use RFID for fare collection	**12**	**17**	**-**	**7**
PC13. coordinate with the relevant vendor for the installation of RFID smart card readers at entry and exit points on public transport vehicles	2	3	-	1
PC14. ensure the odometer on the transport vehicles are able to collect data concerning the revolution of wheels	2	3	-	1
PC15. ensure the smart card readers are connected to the odometer on the transport vehicle and can charge passengers' smart cards based on the distance covered by them	2	2	-	1
PC16. arrange for uninterrupted power supply to smart card readers	1	2	-	1
PC17. use the 5G network connectivity for reliable and real-time collection of fare collection data	1	3	-	1
PC18. check the fare collection reports to ensure fare computation and collection data is correct	2	2	-	1
PC19. coordinate with the smart card reader manufacturer for the identification and resolution of potential issues with smart card readers	2	2	-	1
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6257
NOS Name	Use Internet of Things (IoT) Technology in Transport
Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	30/06/2025
NSQC Clearance Date	30/06/2022

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N6252.Carry out Troubleshooting for IoT Devices and Connectivity Issues	30	55	0	15	100	25
TEL/N6253.Assist in Providing IoT Solutions to Clients	30	60	0	10	100	25
TEL/N9101.Organise Work and Resources as per Health and Safety Standards	30	60	-	10	100	20
TEL/N9102.Interact Effectively with Team Members and Customers	25	65	-	10	100	20
Total	**115**	**240**	**-**	**45**	**400**	**90**

Elective: 1 IoT - Smart City

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N6254.Assist in Creating Smart Cities by Implementing Internet of Things (IoT) Solutions	20	70	0	10	100	10
Total	**20**	**70**	**-**	**10**	**100**	**10**

Elective: 2 IoT - Agriculture

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N6255.Use Internet of Things (IoT) Technology in Agriculture	25	55	0	20	100	10
Total	**25**	**55**	**-**	**20**	**100**	**10**

Elective: 3 IoT - Telemedicine

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N6256.Use Internet of Things (IoT) Technology in Telemedicine	35	50	0	15	100	10
Total	**35**	**50**	**-**	**15**	**100**	**10**

Elective: 4 IoT - Transport

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N6257.Use Internet of Things (IoT) Technology in Transport	30	50	0	20	100	10
Total	**30**	**50**	**-**	**20**	**100**	**10**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.