Model Curriculum

QP Name: IoT Installation Solution Architect

QP Code: TEL/Q6216

QP Version: 1.0

NSQF Level: 5

Model Curriculum Version: 1.0

Telecom Sector Skill Council
Estel House, 3rd Floor, Plot No:- 126, Sector 44
Gurugram, Haryana 122003

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Training Parameters

Sector	Telecom
Sub-Sector	Network Managed Services
Occupation	Network Operation and Maintenance
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3114.6216
Minimum Educational Qualification & Experience	B.E./B.Tech (Electronics/Telecom/IT and other relevant fields) **OR** Graduate in relevant field with 1 year of relevant experience **OR** Diploma (3 years after Class 12th in Electronics/Telecom/IT and other relevant fields) with 1 year of relevant experience **OR** Class 10th + ITI (2 years in Electronics/Telecom/IT and other relevant fields) with 4 years of relevant experience **OR** Class 12th Pass with 4 years of relevant experience **OR** Certified in NSQF-L4 Telecom Technician – IoT Devices/Systems with 2 years of relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	21 Years
Last Reviewed On	30/06/2022
Next Review Date	30/06/2025
NSQC Approval Date	30/06/2022
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	570 Hours
Maximum Duration of the Course	570 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.
- Implement steps to assess industry trends and collect information on leading IoT devices dealers.
- Analyse current services and evaluate requirement for new IoT services.
- Prepare cost workout for IoT solution implementation.
- Perform pre-installation activities.
- Manage IoT devices and system installation executed by technicians and check routing for connected devices.
- Implement steps to perform acceptance testing (AT) of the installed IoT devices based on the business model and optimization of devices.
- Prepare required reports/logs.
- Discuss how to plan work effectively, implement safety practices and optimize use of resources.
- Demonstrate how to communicate, develop interpersonal skills and become gender and Person with Disability (PwD) sensitive.

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**	**00:00**	**00:00**	**-**	**08:00**
Module 1: Role and Responsibilities of IoT Installation Solution Architect	08:00	00:00	00:00	-	08:00
TEL/N6260 – Perform Market Analysis on Application of IoT **NOS Version No. 1.0** **NSQF Level 5**	**52:00**	**84:00**	**45:00**	**-**	**181:00**
Module 2: Carry Out Market Analysis on Application of IoT	52:00	84:00	45:00	-	181:00
TEL/N6261 – Supervise in installation of IoT devices and system **NOS Version No. 1.0** **NSQF Level 5**	**52:00**	**84:00**	**45:00**	**-**	**181:00**
Module 3: Supervise the installation activities of IoT devices and system	52:00	84:00	45:00	-	181:00

TEL/N6262 – Administer acceptance testing and site optimization activities **NOS Version No. 1.0** **NSQF Level 5**	**36:00**	**54:00**	**30:00**	**-**	**120:00**
Module 4: Carry out acceptance testing and site optimization	36:00	54:00	30:00	-	120:00
TEL/N9103: Implement effective communication and coordination at work **NOS Version-1.0** **NSQF Level-5**	**16:00**	**24:00**	**00:00**	**-**	**40:00**
Module 4: Process of implementing Effective communication and coordination at work	16:00	24:00	00:00	-	40:00
TEL/N9104: Manage work and resources, and ensure health and safety at work **NOS Version-1.0** **NSQF Level-5**	**16:00**	**24:00**	**00:00**	**-**	**40:00**
Module 5: Process of managing work and resources, and ensure health and safety at the work	16:00	24:00	00:00	-	40:00
Total Duration	**180:00**	**270:00**	**120:00**	**-**	**570:00**

Module Details

Module 1: Role and Responsibilities of IoT Installation Solution Architect
Mapped to Bridge Module

Terminal Outcomes:

- Identify the role and responsibilities of IoT Installation Solution Architect.
- Explain the scope of work for IoT Installation Solution Architect.

Duration: *08:00*	Duration: *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the role and responsibilities of IoT Installation Solution Architect. - Describe the various electrical and electronic components. - Describe the standard operating procedures (SOP) to be followed for use of tools and equipment and for performing service and minor repairs. - Describe the safety, health and environmental policies and regulations for the work place as well as for telecom sites in general. - Discuss required documentation in organization and its importance.	
Classroom Aids:	
Whiteboard and markers, chart paper and sketch pens, LCD Projector and Laptop for presentations	
Tools, Equipment and Other Requirements	
PCs/Laptops, Internet with Wi-Fi (Min 2 Mbps Dedicated), documents of standard operating procedures, code of conduct, checklists, schedules, tools and equipment, status report	

Module 2: Carry Out Market Analysis on Application of IoT
Mapped to TEL/N6260 v1.0

Terminal Outcomes:

- Assess industry trends
- Collate data on leading suppliers of IoT devices
- Analyse existing services and derive potential need for a new IoT services
- Prepare a budget (cost workout) for implementing the IoT solution in the business

Duration: *52:00*	Duration: *84:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Discuss how to gather and evaluate data related to industry trends/technologies and their impact from different reliable sources. - List the products, customers, competitors and landscapes to confirm IoT devices preferences. - Explain how to collect information about latest industry trends and company's requirements. - Discuss how to find out the logistics operations and approach businesses by reanalysing the methods. - Explain how to perform analysis of IoT application for the existing business model and the benefits which can be accomplished in the value chain. - Discuss the importance of keeping transparency in customer transactions. - Describe the life cycle and working of IoT device. - Discuss machines performance to be supplied to chain and logistics operations. - Explain the connection of IoT with robotics and artificial intelligence. - Describe sensors along with their types, various data formats and actuators. - Discuss different security mechanisms and their features. - Explain the importance of awareness of M2M communication. - Describe RF environments, vertical/horizontal obstruction. - Discuss the effect of metal body on sensors and RF environment.	- Implement steps to update standards and practices of emerging IoT technologies regularly. - Perform classification of industry types for technology implementation based on usage. - Demonstrate how to evaluate the geographical features by using different parameters of identification and map reading. - Employ ways to gather the required range of access technology and frequency band based on site/customer specifications. - Prepare a list of foremost suppliers and key solution providers. - Implement steps for supplier assessment on the basis of solution performance, geographic availability, support services and security, etc. - Employ proper techniques to recognize different ways for business operation with continuously varying real-time data. - Employ ways to confirm that machines providing real-time data execute based on requirements/specifications. - Demonstrate how to evaluate current and potential tools for business strategies enhancement required to sell and integrate IoT devices. - Implement ways for key optimization business requirements assessment to choose an IoT solution. - Demonstrate how to assess potential of stakeholders and customers for the business.

	• Employ proper methods to evaluate the use of sensors and other IoT devices within different domains and existing business model.
	• Implement ways to evaluate range of tracking business processes and customer experience (CX) improvement as per latest IoT devices application from diverse customers.
	• Demonstrate how to recommend an appropriate IoT solution as per requirements/specifications and collected market data for the business model.
	• Implement steps to create a connectivity diagram of the mandatory devices to the application server for its requirements evaluation.
	• Demonstrate how to prepare costs workouts for IoT devices implementation/integration and services into the existing business and operations in progress.
	• Perform classification of involved implementation/integration costs such as hardware and software.
	• Implement steps to make a descriptive budgets/costs report and discuss the same with the authorized personnel to get a signoff before IoT solution implementation.

Classroom Aids:

Laptop, white board, marker, projector

Tools, Equipment and Other Requirements

IoT devices, sensors, costs reports, documents related to industry trends, etc.

Module 3: Supervise the installation activities of IoT devices and systems
Mapped to TEL/N6261 v1.0

Terminal Outcomes:
- Advise the team on pre-installation activities
- Inspect routing for connected devices

Duration: *52:00*	Duration: *84:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- List the different types of micro-processor boards required for integration based on present set up needed on site. - Discuss required software/hardware into IoT solution for attaining optimal output. - Explain the working procedure including Data Collection, Device Integration, etc. - Discuss how to recognize the devices application used to collect, send and act on data. - List the frameworks used in IoT including Amazon Web Services (AWS) IoT , Arm Mbed IoT, etc. - Explain IoT architecture including hardware setup on breadboard or preboard. - Describe different smart devices categories such as accelerometers-temperature sensors, etc. along with required features like Connectivity, Analysing, etc. - Explain IoT platforms that connect sensors and devices, controls software communication protocol and hardware giving security. - Discuss use cases of IoT in various industries, IoT markets along with market analysis procedure. - Describe connectivity technologies such as Infrared, etc. and networking protocols such as MQTT, etc. - Discuss radio planning and tools being used such as Aircom Asset Mentum Planet, etc. - Explain optimization engines and network optimization to analyse quality and interference performance. - Describe network dimensioning to identify equipment requirements, coverage capacities, quality etc.	- Demonstrate how to examine the basic connectivity, network and communication protocols. - Implement steps to inspect basic elements availability needed for installation, set up and connection of the devices. - Demonstrate how to classify the embedded systems, communication hardware and inspect their efficiency for collecting and tracking data. - Perform classification of the microcontrollers required for installation along with their quantity and application in the existing business model. - Demonstrate how to examine the working of different sensors, gyro meter, accelerometer, video surveillance cameras etc. along with their need for the existing business model. - Perform sensors fitment to the business model application assessment. - Employ proper ways to assess advanced features implementation such as Data Distribution Service (DDS), Advanced Message Queuing Protocol (AMQP), etc. - Implement ways to examine short- and long-range protocols application including 3G/4G, 6LowPAN, etc. - Demonstrate how to classify communication protocols application in IoT with the ones needed for existing specification. - Implement steps to confirm fitting of requirements to IoT architecture along with mapping to the business need.

Classroom Aids:

Whiteboard and markers, chart paper and sketch pens, LCD Projector and Laptop for presentations

Tools, Equipment and Other Requirements

Micro-processor boards, IoT devices, sensors, etc.

Module 4: Carry out Acceptance Testing and Site Optimization
Mapped to TEL/N6262 v1.0

Terminal Outcomes:

- Supervise acceptance testing (AT) of the integrated IoT solution in the business
- Monitor optimization of devices
- Prepare reports and logs

Duration: *36:00*	Duration: *54:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the importance of using personal protection equipment as per organizational protocol. - Discuss electrical safety compliances and EMI/EMC hygiene requirements. - Discuss the risk and impact of not following procedures/work instructions. - Describe escalation matrix for reporting identified incidents, troubles and/ or emergencies. - Discuss equipment weight and size requirement, spare management, repair and return procedure for faulty equipment. - Explain the importance of maintaining records and implications of non-maintenance of the same. - Discuss the benefits of IoT.	- Implement steps to find the requirements to perform acceptance testing for the executed resolution. - Demonstrate how to validate all installed sensors and other IoT devices based on business model. - Implement steps to carry out testing as per expected output from requirement analysis or user specifications. - Demonstrate how to examine system settings, alarms and nodal functionality along with identifying any faults. - Employ proper ways to confirm correct functioning of test tools. - Demonstrate how to assess system test efficiency for IoT application to measure baseline noises, movements and noise sensitivity in order to confirm its effectiveness in the business model. - Implement steps to report test results to site engineers/authorized personnel for confirming IoT solution effectiveness. - Demonstrate how to examine the strength of the existing network security and check its resistance to hacking or any other attacks. - Perform security testing of integrated IoT devices against outsider invasion or other threats. - Implement steps to authenticate IoT solution integrity and data security level of IoT devices in order to take required actions. - Demonstrate how to provide assistance in optimization by carrying out basic walk tests based on engineers' guidance in order to achieve optimal results.

	• Implement steps to inspect existing network traffic and data being used by IoT devices and improve data transfer and monitoring by applying optimization techniques. • Demonstrate how to detect and control IoT traffic from installed devices and its services. • Implement steps for device integration optimization to the IoT application(s) to attain projected results even in case of higher volume of traffic. • Demonstrate how to use effective mechanism to improve the control plane messaging from IoT devices in order to attain IoT devices/network optimization. • Implement steps to evaluate site safety and emergency readiness compliance as per organisation. • Employ proper ways to work while taking environmental conditions and hazards like Earth Potential Rise (EPR) into consideration. • Demonstrate how to carry out data transfer over a network without any human-to-human or human-to-computer communication. • Implement steps to document all data/monitoring events from sensors, test results in prescribed online logs/formats along with their timely maintenance and reporting them to authorized personnel. • Demonstrate how to examine installation and functioning of all active/passive equipment along with maintaining their status in a log book. • Implement steps to verify validation of all records in order to find any anomalies in working of IoT devices.

Classroom Aids:

Whiteboard and markers, chart paper and sketch pens, LCD Projector and Laptop for presentations

Tools, Equipment and Other Requirements

Personal protection equipment (PPE), escalation matrix, logs/formats, prescribed reports, sensors, IoT devices, test tools, etc.

Module 5: Process of implementing Effective communication and coordination at work

Mapped to TEL/N9103 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**
- 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 methods of communication. - State different types of information that colleagues might need and the importance of providing this information in an appropriate manner. - Explain the importance of helping colleagues with problems, in order to meet quality and time standards as a team. - 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 statutory bodies and the right way to use them including various medical conditions associated with PwD - Explain the health and safety	- Demonstrate the process of reporting any unforeseen disruptions or delays to superiors and/or concerned persons. - Show how to communicate information using different techniques such as face-to-face, telephonic and written means. - Demonstrate sensitivity towards gender and person with a disability while communicating.

requirements at a workplace for PwD.

- List various rights and duties at a workplace with respect to 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.

Classroom Aids

White board/ black board marker / chalk, Duster, Computer or Laptop attached to LCD projector

Tools, Equipment and Other Requirements

Personal Protection Equipment: Safety glasses, Head protection, Rubber gloves, Safety footwear, Warning signs and tapes, Fire extinguisher and First aid kit

Module 6: Process of managing work and resources, and ensure health and safety at the work

Mapped to NOS TEL/N9104 v1.0

Terminal Outcomes:

- Explain how to manage learning and self-direction.
- Explain the importance of developing critical thinking and problem solving.
- Explain the importance of performing work as per quality standards and maintaining a safe and secure working environment.
- Describe the process of complying with material / energy / electricity conservation practices.

Duration: *16:00*	Duration: *24:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the strategies pertinent to the field that can be used to pursue the advancement of skills. - State the key performance indicators for the new tasks. - Describe the feedback processes and formats. - State the timelines and goals as well as their relevance to work allocated. - Explain the importance of quality and timely delivery of the product/service. - State the layout of the workstation and equipment used. - Explain the escalation matrix and its importance, especially in case of emergencies. - Explain various ways of time and cost management. - Explain 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. - Describe the procedures to report breaches in health, safety and security. - Explain ways of managing resources and material efficiently.	- Demonstrate the process of creating schedules and rosters for the team to ensure they understand individual work requirements. - Demonstrate the process of reporting any hazard outside the individual's authority to the relevant person in line with organizational procedures and warn others who may be affected. - Demonstrate the process of carrying out routine cleaning of tools, machines and equipment.

• Explain ways to recognize common electrical problems and common practices of conserving electricity.	

Classroom Aids

Training Kit (Trainer **G**uide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements

Relevant stationery, First Aid Kit and Equipment used in Medical Emergencies.

Module 7: On-the-Job Training
Mapped to IoT Installation Solution Architect (TEL/Q6216 v1.0)

Mandatory Duration: *120:00*	Recommended Duration: *00:00*
Location: On-Site	

Terminal Outcomes

1. Perform steps for surveying sites for layout, planning and designing for installation.

2. Demonstrate deployment of IoT sensors/devices, IoT gateways in IoT ecosystem.

3. List some of the best IoT solution for the business model.

4. Collate the data pertaining to the changing technologies in the industry trends from various reliable sources.

5. Evaluate the selected supplier.

6. Test the IoT devices for real-time data optimization as per requirements and specifications.

7. Monitor and improvise the business strategies for selling and integrating IoT devices.

8. Test the sensors and other IoT devices within different fields like agriculture, etc.

9. Perform checks for basic connectivity, network and communication protocols.

10. Evaluate the implementation of advanced features including Data Distribution Service (DDS), Advanced Message Queuing Protocol (AMQP), Constrained Application Protocol (CoAP), etc.

11. Use sensors, actuators and embedded microcontrollers.

12. Record warning notifications and diagnosis of equipment provided by predictive analytics software and analyse these to perform maintenance.

13. Troubleshoot and fix the faults on site.

14. Run test security of integrated IoT devices against outsider invasion or other threats.

15. Record data in various formats (PDF/XML/HTML/DOC) to generate required diagnostic and other reports.

Annexure

Trainer Requirements

Trainer Prerequisites					
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
B.E./B.Tech/ BCA/B.Sc.	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 Installation Solution Architect**" "TEL/Q6216, 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 Experience		Remarks
		Years	*Specialization*	*Years*	*Specialization*	
B.E./B.Tech/ BCA/B.Sc.	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 Installation Solution Architect**" "TEL/Q6216, 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
   - 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
   - Assessor must be ToA certified & trainer must be ToT Certified
   - 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:
   - Surprise visit to the assessment location
   - Random audit of the batch
   - 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	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	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.

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
SOP	Standard Operating Procedures
CRM	Customer Relationship Management
CX	Customer Experience
AWS	Amazon Web Services
DDS	Data Distribution Service
AMQP	Advanced Message Queuing Protocol
EPR	Earth Potential Rise
OHS	Occupational Health and Safety
PwD	Persons with Disabilities
ICT	Information and Communication Technology
AT	Acceptance Testing