

Model Curriculum

Telecom Technician - IoT Devices/Systems (Installation & M2M Communication Setup)

SECTOR: TELECOM
SUB-SECTOR: Network Management
OCCUPATION: OPERATION & MAINTENANCE
REF ID: TEL/Q6210
NSQF LEVEL: 4



Certificate

**COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL
STANDARDS**

is hereby issued by the

TELECOM SECTOR SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of

Job Role/Qualification Pack : 'Telecom Technician - IoT Devices/Systems (Installation & M2M Communication Setup)'

QP No : 'TEL/Q6210 Level 4'

Date of Issuance : Dec 4th 2017

Valid up to* : Dec 4th 2019

*Valid upto the next review date of the Qualification Pack

Authorized Signatory
(Telecom Sector Skill Council)

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Telecom Technician – IoT Devices/Systems (Installation & M2M Communication Setup)

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Telecom Technician – IoT Devices/Systems”, in the “Telecom” Sector/Industry and aims at building the following key competencies amongst the learner.

Program Name	JOB ROLE		
Qualification Pack Name & Reference ID.	Telecom Technician - IoT Devices/Systems (Installation & M2M Communication Setup) TEL/Q6210		
Version No.	1.0	Version Update Date	26/10/2017
Pre-requisites to Training	Practical knowledge on use of Web Services		
Training Outcomes	<p>After completing this programme, participants will be able to</p> <ul style="list-style-type: none"> • Installation of IoT Devices at Customer Premises/equipment: Understanding of IoT devices (nodes and gateways), identification of suitable points/locations for installing IoT devices and installation of IoT devices • Configure IoT devices and establish communication links: Connecting nodes & gateways (with hardware pre-configured) to data transfer devices (PC/Laptop) for software upload to micro-controllers, on-board compilation and debugging of software, establishing connectivity between nodes and gateway, and establishing connectivity between gateway and backend servers • Troubleshoot the IoT devices: Troubleshooting at IoT nodes, troubleshooting at IoT Gateways and troubleshooting of node-gateway (short range) and gateway-server (over Wi-Fi, 3G, 4G) communication • Maintain Health and Safety: Work in accordance with Health and Safety and Emergency procedures, standards and guidelines of the organization 		

This course encompasses 4 out of 4 National Occupational Standards (NOS) of “Telecom Technician – IoT Devices/Systems” Qualification Pack issued by “TSSC: Telecom Sector Skills Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Introduction to the IoT Technology and Telecom</p> <p>Theory Duration (hh:mm) 12:00</p> <p>Practical/Interactive class Duration (hh:mm) 20:00</p> <p>Corresponding NOS Code TEL/N6234</p>	<ul style="list-style-type: none"> Understand basic types of micro-processor boards and microcontrollers Explain the functioning of different types of sensors and actuators Identify the application of short range and long range communication protocols Identify the components and PIN configurations on micro-controller boards Understand the interconnectivity provisions for Input/output/power supply etc. Differentiate between node and gateway Identify suitable points/locations for installing IoT devices 	<p>Microprocessor Boards</p> <p>Arduino-BCMI/ Uno</p> <p>Nano 32- ESP 32</p> <p>Raspberry-pi</p> <p>Desktop PCs</p> <p>Pressure sensor, Accelerometer and Gyroscope, Temperature sensor, Humidity sensor, Proximity sensor, Touch sensor, Analog and Digital sensor, reed sensor, and Video surveillance cameras</p> <p>Ethernet and power cables</p>
2	<p>Identifying the hardware and protocol requirements for IoT</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical/Interactive class Duration (hh:mm) 20:00</p> <p>Corresponding NOS Code TEL/N6234</p>	<ul style="list-style-type: none"> Identify installation points for nodes/sensors Install gateway as per the power supply requirements Establish clear line of communication between nodes and gateway and between gateway and servers via 3G/4G or Wi-Fi networks Establish Ethernet connectivity, as required Installation of IoT devices 	<p>Gateway and nodes for installation</p> <p>Router set up with cables</p> <p>Ethernet cable, power cables and power supply</p>
3	<p>Establishing the entire framework to work in a production scale</p> <p>Theory Duration (hh:mm) 12:00</p> <p>Practical/Interactive class Duration (hh:mm) 10:00</p>	<ul style="list-style-type: none"> Preparing the mounting surface at site for mounting the device Mounting the IoT devices at identified locations at site Providing necessary connections such as power-supply, earthing, grounding and ensuring no floating earth situation. 	<p>Sensors (Wired and Wireless) mounting kit</p> <p>Connecting cables to processor board (directly/through bread-boards)</p> <p>Power supply</p> <p>Tool kit</p>

	<p>Corresponding NOS Code TEL/N6234</p>		
4	<p>Establishing microprocessors set up and communication between them</p> <p>Theory Duration (hh:mm) 12:00</p> <p>Practical/Interactive class Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code TEL/N6235</p>	<ul style="list-style-type: none"> Understand connectivity options available on micro controller boards for data transfer Connect the boards using appropriate cable and connectors, micro controller to data transfer device (PC/Laptop) Install suitable framework (on PC/Laptop), compatible with the micro-controller board Transfer software code to on-board microprocessor on nodes and gateways Compile code on-board microprocessor using PC/laptop based framework Understand error codes and debug software Confirm proper functioning of micro-controller and attached devices using emulators/framework features 	<p>IoT devices such as:</p> <ul style="list-style-type: none"> Sensors Controllers Recorders Power meters Security cameras <p>Software to enable monitoring of IoT devices through consoles</p> <p>LoRa WAN, gateway nodes, LED lights</p> <p>Connecting cables to processor board</p>
5	<p>Interconnecting the Hubs and Edge appliances: Prerequisites and expectations</p> <p>Theory Duration (hh:mm) 12:00</p> <p>Practical/Interactive class Duration (hh:mm) 20:00</p> <p>Corresponding NOS Code TEL/N6235</p>	<ul style="list-style-type: none"> Initialize the nodes and gateways for execution of the uploaded software Launch the software on nodes and gateways Confirm communication /data transfer using onscreen I/O streams or appropriate LED indications {as per the system test manual} Establish connectivity between gateway and local Wi-Fi router or 3G/4G connectivity options (preconfigured in the uploaded software on gateway microcontroller) Check for data transfer and confirm from the server end 	<p>Software to enable monitoring of IoT devices through consoles</p> <p>DSL Modem, Router Cables, tool kit</p> <p>Testing tool, network set up, PC</p> <p>Wi-Fi connectivity</p>

<p>6</p>	<p>Controlling Devices</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical/Interactive class Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code NA</p>	<ul style="list-style-type: none"> • Understand controlling devices • Control Edge appliances • Control Hubs • Understand authentication and authorization mechanism 	<p>Desktop PCs</p> <p>Devices for communication set up, hubs</p>
<p>7</p>	<p>Third Party Access and Security</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical/Interactive class Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code NA</p>	<ul style="list-style-type: none"> • Use third party tool and software for access control • Enlist third party software for access control • Control access using security • Check for Malware and DDoS attacks 	<p>Desktop PCs</p>
<p>8</p>	<p>Cloud Optimization and Business Analytics</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical/Interactive class Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code TEL/ N6235</p>	<ul style="list-style-type: none"> • Understanding concept of cloud in IoT • Exploiting the maximum utilization of the cloud. • Implementing Business Analysis • Deployment to the cloud from IoT perspective • Challenges • Business model canvas for IoT 	<p>Power, connectivity cables, programming framework</p> <p>Desktop PCs</p>

<p>9</p>	<p>Configuring Devices</p> <p>Theory Duration (hh:mm) 12:00</p> <p>Practical/Interactive class Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code TEL/ N6236</p>	<ul style="list-style-type: none"> • Test the connectivity (PIN configurations) between sensors and micro-controller device using appropriate software tools/framework • Test connectivity between nodes and gateway using appropriate software tools/framework • Check on-board memory storage card for storing node data (using appropriate micro-controller board software/framework) • Check working of on-board Wi-Fi module, 3G, 4G connectivity module, as applicable at the nodes • Check the on-board power supply • Check communication link performance matrix between node and gateway using appropriate software tools/framework • Check data transfer from gateway to server • Re-load node & gateway software to check communication between devices • Set appropriate connectivity ID's/password in the software code 	<p>Microprocessor Boards</p> <p>Arduino-BCMI/ Uno</p> <p>Nano 32- ESP 32</p> <p>Raspberry-pi</p> <p>Power, connectivity cables, programing framework</p> <p>Desktop PCs</p>
<p>10</p>	<p>Major Project Implementation</p> <p>Practical/Interactive class Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code NA</p>	<ul style="list-style-type: none"> • Mount the IoT device on a site • Install the code on the micro controller chip • Install the software to control the IoT device remotely • Configure the IoT device with the software • Make necessary cable and other connections • Test the set up 	<p>Microprocessor Boards</p> <ul style="list-style-type: none"> • Arduino-BCMI/ Uno • Nano 32- ESP 32 • Raspberry-pi <p>Power, connectivity cables, programing framework</p> <p>Desktop PCs</p>
<p>11</p>	<p>Understanding Organization Policies</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code TEL/N6234, TEL/N6235, TEL/N6236, TEL/N2509</p>	<ul style="list-style-type: none"> • Understand the organizational processes and standards • Explain project management concepts and applications • Identify importance of decision making decision and problem solving • Explain the importance of maintaining records • Record performance/test results • Maintain records and process document as per the given format • Develop reading, writing, communication and interpersonal skills 	

		<ul style="list-style-type: none"> Explain special policies for women working at monitoring consoles 	
12	<p>Maintaining Health and Safety</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical/Interactive class Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code TEL/N2509</p>	<ul style="list-style-type: none"> Define safety hazards Explain the various types of hazards Explain the steps involved in dealing with hazards Explain the importance of safe work area List the requirements for safe work area Discuss the steps involved in dealing with emergency Explain the importance of maintaining the standards of health, safety and security Describe safety breaches Discuss evacuation procedures and the norms and services of government agencies in the area of safety, health and security 	
	<p>Total Duration</p> <p>Theory Duration 120:00</p> <p>Practical Duration 180:00</p>	<p>Unique Equipment Required:</p> <p>Smartphones, laptops and desktops, Digital Communication Devices, projector, black board, white board</p>	

Grand Total Course Duration: 300 Hours, 0 Minutes

Trainer Prerequisites for Job role: “Telecom Technician – IoT Devices/Systems” mapped to Qualification Pack: “TEL/Q6210, V. 1.0”

Sr. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “TEL/Q6210, Version No. 1.0”.
2	Personal Attributes	The individual should have good communication skills with a clear diction, ability to construct simple and sensible sentences; ability to comprehend simple English sentences; good problem solving skills and ability to approach problems logically; strong customer service focus; ability to work under pressure and active listening skills. The individual should also be willing and comfortable to work in shifts.
3	Minimum Educational Qualifications	ITI/Diploma: Electrical/ Electronic/ Telecommunication/CS/IT
4a	Domain Certification	Certified for Job Role: (Telecom Technician - IoT Devices/Systems (Installation & M2M Communication Setup)” mapped to QP: “TEL/Q6210”, Version No. 1.0. Minimum accepted score as per respective TSSC guidelines.
4b	Platform Certification	Recommended that the Trainer is certified for the Telecom Technician - IoT Devices/Systems (Installation & M2M Communication Setup) “Trainer”, mapped to the Qualification Pack: “TEL/Q6210”, Version No. 1.0”. Minimum accepted score as per respective TSSC guidelines.
5	Experience	<ul style="list-style-type: none"> The trainer should be certified by TSSC as ‘Train the Trainer’ and Assessor Worked as IoT installation and service technician for a minimum of 1 year

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Telecom Technician - IoT Devices/Systems (Installation & M2M Communication Setup)
Qualification Pack	TEL/Q6210, Version No. 1.0.
Sector Skill Council	Telecom

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. TSSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the TSSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below)
4	To pass the Qualification Pack, every trainee should score overall of 70%.
5	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
TEL/N6234 Understanding of IoT devices (nodes and gateways)	PC1. understand basics of various type of micro-processor boards (Arduino, raspberry-Pi, customized platforms etc.)		10	10	0
	PC2. understanding functioning of various type of sensors (humidity, temperature, reed, pressure, gyrometer, accelerometer, video surveillance cameras etc) and Actuators.		10	5	5
	PC3. understand basics of short range communication protocols (blue tooth, Zigbee, Wi-Fi, etc) and long range protocols including 3G/4G, 6LowPAN, LoRa etc and their applicability in IoT		10	6	4

	PC4. identify various components and PIN configurations on the micro-controller boards and interconnectivity provisions for input/output/power supply etc.	100	10	0	10
	PC5. differentiate between node and a gateway		10	5	5
	PC6. establish installation points to capture desired input parameters by the\nodes/sensors		10	4	6
	PC7. establish installation point for gateway accounting for power supply\n requirements		10	4	6
	PC8. establish clear line of communication between nodes and gateway and between gateway and servers via 3G/4G or Wi-Fi networks		10	0	10
	PC9. Establish Ethernet connectivity, as required 3G/4G or Wi-Fi networks.				
	PC10. prepare surface at location/point for mounting the device		10	4	6
	PC11. mounting of IoT devices at identified locations/points		10	4	6
	PC12. provide necessary connections to power supply, earthing, ensure proper grounding, no-floating earth situation and understanding of SNR in case of wiring				
	Total		100	42	58
TEL/N6235 Connecting nodes and gateways to data transfer devices for software upload to micro-controllers	PC1. understand connectivity options available on micro controller boards for data transfer		10	4	6
	PC2. connect, using appropriate cable and connectors, micro controller to data transfer device (PC/Laptop)		8	0	8
	PC3. install suitable framework (on PC/Laptop), compatible with the micro-controller board	6	0	6	
	PC4. transfer software code to on-board micro-processor on nodes and gateways	6	0	6	
	PC5. compile code on-board microprocessor using PC/laptop based framework	6	0	6	
	PC6. understand error codes and debug software	8	4	4	
	PC7. confirm proper functioning of micro-controller and attached devices using	8	0	8	

	emulators/framework features				
	PC8. initialize the nodes and gateways for execution of the uploaded software	100	8	0	8
	PC9. launch the software on nodes and gateways		10	4	6
	PC 10.confirm communication /data transfer using on-screen I/O streams or appropriate LED indications {as per the system test manual}		10	4	6
	PC11. Establish connectivity between gateway and local Wi-Fi router or 3G/4G connectivity options (pre-configured in the uploaded software on gateway micro-controller)		10	4	6
	PC12. Check for data transfer and confirm from the server end		10	0	10
	Total			100	20
TEL/N6236 Troubleshooting at IoT nodes	PC1. test connectivity (PIN configurations) between sensors and micro-controller device using appropriate software tools/framework	100	8	2	6
	PC2. check on-board power supply		6	3	3
	PC3. re-load node software		6	0	6
	PC4. test connectivity between nodes and gateway using appropriate software tools/framework		8	4	4
	PC5. check on-board power supply		6	0	6
	PC6. check all connectivity and PIN/jumper settings		10	4	6
	PC7. check on-board memory storage card for storing node data (using appropriate micro-controller board software/framework)		8	4	4
	PC8. check working of on-board Wi-Fi module, 3G, 4G connectivity module, as applicable, at the nodes		10	4	6
	PC9. check working of on-board Wi-Fi, 3G, 4G connectivity module, as applicable		10	4	6
	PC10. Set appropriate connectivity ID's/password in the software code		8	3	5
	PC11. check communication link performance matrix between node and gateway using		8	2	6

	appropriate software tools/framework				
	PC12. re-load node & gateway software, if required, and check communication again		6	0	6
	PC13. check data transfer from gateway to server		6	0	6
	Total		100	30	70
TEL/N2313 Health & Safety	PC1. ensure that work is carried out in accordance with the laid down safety, security policies and procedures of the organization	100	10	6	4
	PC2. ensure that site is assessed for safety and emergency readiness compliance as per company's guidelines		12	6	6
	PC3. ensure electrical safety compliances and EMI/EMC hygiene requirements are met as per the guidelines		15	9	6
	PC4. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		15	10	5
	PC5. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		12	7	5
	PC6. follow your organization's emergency procedures promptly, calmly and efficiently		12	6	6
	PC7. identify and recommend opportunities for improving health, safety, security to the designated person		14	8	6
	PC8. complete any health and safety records legibly and accurately		10	5	5
	Total		100	57	43
	Grand Total		400	149	251
	Percentage Weightage:			37	63
	Minimum Pass% to qualify (aggregate):			70%	