

# Model Curriculum

## ICT Engineer

**SECTOR:** TELECOM

**SUB-SECTOR:** Network Managed Services

**OCCUPATION:** Operation and Maintenance

**REF ID:** TEL/Q6205

**NSQF LEVEL:** 6



## Certificate

### COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

TELECOM SECTOR SKILL COUNCIL

for

#### SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of  
Job Role/ Qualification Pack: 'ICT ENGINEER'  
QP No. 'TEL/ Q6205 NSQF Level 6'

Date of issuance: **June 20<sup>th</sup>, 2014**

Valid up to: **October 10<sup>th</sup>, 2016**

\* Valid up to the next review date of the Qualification Pack

Authorised Signatory  
(Telecom Skill Development Council)

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# ICT Engineer

## CURRICULUM / SYLLABUS

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

<b>Program Name</b>	<b>ICT Engineer</b>		
<b>Qualification Pack Name &amp; Reference ID. ID</b>	TEL/Q6205		
<b>Version No.</b>	1.0	<b>Version Update Date</b>	
<b>Pre-requisites to Training</b>	Graduate in Science /Engineering/Technology - Electronics, Computer Science and IT		
<b>Training Outcomes</b>	<p><b>After completing this programme, participants will be able to:</b></p> <ul style="list-style-type: none"> <li>• Plan the preventive maintenance activities</li> <li>• Conduct Periodic Maintenance activities</li> <li>• Perform corrective maintenance at ICT nodes</li> <li>• Undertake upgrade, capacity augmentation and configuration change activities</li> <li>• Carry out point of interconnecting test</li> <li>•</li> </ul>		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of “ICT Engineer” Qualification Pack issued by “Telecom Sector Skill Council of India”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p><b>Overview</b></p> <p><b>Theory Duration</b> (hh:mm) 25:00</p> <p><b>Practical Duration</b> (hh:mm) 00:00</p> <p><b>Corresponding NOS Code</b> Bridge Module</p>	<ul style="list-style-type: none"> <li>Complete overview about the ICT node, equipment, operations and standard safety precautions.</li> <li>Overview of various types of equipment and technology along with test tools and procedures</li> </ul>	ICT Node setup
2	<p><b>Key concepts</b></p> <p><b>Theory Duration</b> (hh:mm) 10:00</p> <p><b>Practical Duration</b> (hh:mm) 05:00</p> <p><b>Corresponding NOS Code</b> NA</p>	<ul style="list-style-type: none"> <li>Explain the various mobile and data technologies</li> <li>Know and understand the various product and service offerings in the telecom sector</li> <li>Outline the documentation process and documents needed for mobile customers</li> <li>Explain the key concepts related to ICT technology</li> <li>State the importance of workplace</li> <li>Ergonomics and respect at workplace</li> <li>Express the importance of data confidentiality in the telecom industry</li> </ul>	Laptop, white board, marker, projector,
3	<p><b>Plan the preventive maintenance activities</b></p> <p><b>Theory Duration</b> (hh:mm) 25:00</p> <p><b>Practical Duration</b> (hh:mm) 25:00</p> <p><b>Corresponding NOS Code</b> TEL/N6218</p>	<ul style="list-style-type: none"> <li>Understand the functionality of ICT nodes</li> <li>Use different login cables - RJ45, RS232 etc.</li> <li>Learn how to operate softwares like NMS client</li> <li>Understand the hardware and software issues</li> <li>Learn to maintain the coordination with NOC prior to plan the preventive maintenance schedule</li> <li>Understand the potential impact of the proposed maintenance on customers and network</li> <li>Plan the possible outage prior to the activity</li> <li>Understand how to follow up with the Report &amp; Record team/logistics team in case of delay completion of spare requisition</li> </ul>	Cables: RJ45, RS232, Hi-speed USB, console cable, Network Management tool or software, ICT nodes login applications like Secure CRT, Hyper terminal
4	<p><b>Conduct Periodic Maintenance activities</b></p> <p><b>Theory Duration</b> (hh:mm) 25:00</p> <p><b>Practical Duration</b> (hh:mm) 25:00</p> <p><b>Corresponding NOS Code</b> TEL/N6218</p>	<ul style="list-style-type: none"> <li>Learn how to conduct physical maintenance tasks like checking temperatures, routing of Ethernet and optical fibers, cables ties, earthing, equipment grouting, even distribution of cables etc.</li> <li>Know the procedure to conduct the periodic maintenance activities</li> <li>Ensure the functionality by alarm configuration testing in co-ordination with NOC</li> <li>Learn to escalate emergency/unresolved issues as per the company norms</li> <li>Understand the way to interact with technical team for performing maintenance activities</li> </ul>	Cables: RJ45, RS232, Hi-speed USB, console cable, Network Management tool or software, ICT nodes login applications like Secure CRT, Hyper terminal

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>related to passive infrastructure deployed at ICT nodes or customer premises</p> <ul style="list-style-type: none"> <li>• Monitor the site's alarm status wrt the co-ordination with NOC team</li> <li>• Know how to complete the administrative jobs like site clearance, return of test equipments etc.</li> <li>• Understand how to notify all relevant parties (including NOC team, other supervisors)</li> <li>• Know to update the routine maintenance logs, activity logs and spare tracker within stipulated timelines</li> <li>• Learn to follow the reporting procedures</li> </ul>	
4	<p><b>Technical Knowledge and skills</b></p> <p><b>Theory Duration</b> (hh:mm) 25:00</p> <p><b>Practical Duration</b> (hh:mm) 30:00</p> <p><b>Corresponding NOS Code</b> TEL/N6218 TEL/N6219 TEL/N6220 TEL/N6221</p>	<ul style="list-style-type: none"> <li>• Understand and work on ICT nodes like NodeB, Routers, switches, Transmission equipments, Core equipments, Cloud</li> <li>• knowledge of IP standard &amp; protocols like OSI Layer, Number system, Ethernet Standards, Routing protocols (like RIP, OSPF etc)</li> <li>• knowledge of 3G &amp; 4G technology &amp; its functioning, SDH &amp; DWDM technology and standards</li> <li>• knowledge of CS (Circuit Switch) Call flow &amp; PS (Packet Switch) call flow, Cloud Computing technology and its building blocks</li> <li>• knowledge on how to use console cable to connect to equipments</li> <li>• knowledge of connecting equipments to NMS</li> <li>• Learn how to calculate power cost and site up-time alarm handling process</li> <li>• Know to login to the equipment using relevant cables (RJ45, RS232, Hi Speed USB) for different site equipment like microwave, eNodeB / NodeB etc</li> <li>• Understand and undertake point of interconnect testing as per defined checklist</li> </ul>	<p>Cables: RJ45, RS232, Hi-speed USB, console cable, Network Management tool or software, ICT nodes login applications like Secure CRT, Hyper terminal</p>
5	<p><b>Perform corrective maintenance at ICT nodes</b></p> <p><b>Theory Duration</b> (hh:mm) 20:00</p> <p><b>Practical Duration</b> (hh:mm) 30:00</p> <p><b>Corresponding NOS Code</b> TEL/N6219</p>	<ul style="list-style-type: none"> <li>• Learn how to determine alarm severity, SLAs and the affected network elements</li> <li>• Know how to determine the fault details based on the alarm code/other indicators</li> <li>• Understand the procedure to carry out diagnostic tests to identify the root cause of the alarm</li> <li>• Learn to determine the options for rectification of fault and confirm with supervisor if required.</li> <li>• Understand how to rectify the network problem/fault as per the alarm SLAs and escalation of unresolved faults/instances of delays</li> <li>• Monitor relevant alarms in coordination with NOC team to confirm effectiveness of the rectification process and notify the NOC</li> <li>• Understand how to update activity tracker, issue logs and spare tracker within stipulated timelines</li> </ul>	<p>Cables:RJ45, RS232, Hi-speed USB, console cable, Network Management tool or software, ICT nodes login applications like Secure CRT, Hyper terminal</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		and justify the fault diagnosis and rectification methodology if required	
6	<b>Undertake upgrade, capacity augmentation and configuration change activities</b>  <b>Theory Duration</b> (hh:mm) 25:00  <b>Practical Duration</b> (hh:mm) 30:00 <b>Corresponding NOS Code</b> <b>TEL/N6220</b>	<ul style="list-style-type: none"> <li>Understand the upgradation of hardware, software, capacity augmentation and configuration changes from the NOC team or supervisors</li> <li>Ensure to maintain the timelines for carrying out the changes</li> <li>Know the procedure to carry out changes carried by the central NOC</li> <li>perform pre-testing and observe output of configuration changes</li> <li>Learn how to perform the changes like traffic migrations, capacity augmentation, feature activations, routing configuration etc.</li> <li>Know about the implementation of configurations changes like routing schemes, IP, VLAN, HLR configuration etc. as per requirements</li> <li>Learn to abort change and implement contingency plan released without major disruption to network</li> <li>Learn how to obtain back-up of ICT nodes - both pre-and post-performance of change activities</li> <li>Know how to perform data and call testing to ensure effectiveness of change activities</li> </ul>	Cables: RJ45, RS232, Hi-speed USB, console cable, Network Management tool or software, ICT nodes login applications like Secure CRT, Hyper terminal
7	<b>Carry out point of interconnecting test</b>  <b>Theory Duration</b> (hh:mm) 20:00  <b>Practical Duration</b> (hh:mm) 35:00 <b>Corresponding NOS Code</b> <b>TEL/N6221</b>	<ul style="list-style-type: none"> <li>Learn to carry out physical tests of the POI and logical tests as per the check list</li> <li>Check and coordinate with interconnect vendors for carrying out configuration changes</li> <li>Learn how to notify the NOC and other supervisors</li> </ul>	Cables: RJ45, RS232, Hi-speed USB, console cable, Network Management tool or software, ICT nodes login applications like Secure CRT, Hyper terminal
8	<b>General Safety</b> <b>Theory Duration</b> (hh:mm) 05:00  <b>Practical Duration</b> (hh:mm) 10:00  <b>Corresponding NOS Code</b> <b>TEL/N6218</b> <b>TEL/N6219</b> <b>TEL/N6220</b> <b>TEL/N6221</b>	<ul style="list-style-type: none"> <li>Learn about General Safety while handling electrical/electronic devices</li> <li>Understand Proper use of PPE (Personal Protective Equipment's)</li> <li>Understand on Work Environment Area Protection</li> <li>Learn to escalate safety incidents to relevant authorities as per guidelines</li> </ul>	Laptop, white board, marker, projector, personal protection equipments like anti-static bands, harness, belts and helmets

Sr. No.	Module	Key Learning Outcomes	Equipment Required
9	<b>Program Wrap</b> <b>Theory Duration</b> (hh:mm) 01:00  <b>Practical Duration</b> (hh:mm) 10:00  <b>Corresponding NOS Code</b> <b>NA</b>	<ul style="list-style-type: none"> <li>Understand what is an interview</li> <li>Develop the skills to participate in an interview effectively</li> <li>Know commonly asked questions in an interview</li> <li>Revise and integrate learning's of the training program</li> </ul>	NA
	<b>Total Duration</b> <b>Theory Duration</b> <b>145:00</b> <b>Practical Duration</b> <b>205:00</b>	<b>Unique Equipment Required:</b> Laptop, white board, marker, projector	

Grand Total Course Duration: **350Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [Telecom Sector Skill Council of India](#))



## Trainer Prerequisites for Job role: "ICT Engineer" mapped to Qualification Pack: "TEL/Q6205, v1.0"

Sr. No.	Area	Details
1	<b>Description</b>	Individuals at this job responsible for installing and ensuring uptime of the assigned ICT node/network segment, by undertaking preventive maintenance fault management activities, upgrades, capacity augmentation, configuration changes and Point of Interconnect testing with minimal disruption of services
2	<b>Personal Attributes</b>	A trainer should have good communication skills with a clear diction ability to construct simple and rational sentences; ability to comprehend simple English sentences; regional language proficiency; strong customer service focus; pleasant personality; should be self-motivated and a team player with ability to work under pressure
3	<b>Minimum Educational Qualifications</b>	Graduate in Science /Engineering/Technology - Electronics, Computer Science and IT
4a	<b>Domain Certification</b>	Certified for Job Role:"ICT Engineer" mapped to QP: " <u>TEL/Q6205, v1.0</u> ". Minimum accepted score is 80%
4b	<b>Platform Certification</b>	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "TEL/Q6205". Minimum accepted % as per respective SSC guidelines is 80%.
5	<b>Experience</b>	Minimum 1 year

### Annexure: Assessment Criteria

<b>Assessment Criteria</b>	
<b>Job Role</b>	<b>ICT Engineer</b>
<b>Qualification Pack</b>	<b>TEL/Q6205</b>
<b>Sector Skill Council</b>	<b>Telecom</b>

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. SSC 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 SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on these criteria.
5	To pass the Qualification Pack, every trainee should score a minimum of 40% in every NOS and 50% overall.
6	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)	Total of Sub-Element	Out Of	Theory	Skills Practical
1.TEL/N6218 Perform preventive maintenance at ICT sites	PC1. Plan preventive maintenance schedule along with NOC team	100	22	4	3	1
	PC2. Suggest changes to the planned maintenance schedule considering site criticality, capacity, frequency of faults if required.			5	3	2
	PC3. Assess the potential impact of the proposed maintenance on customers and network and plan for possible outage or deferral of maintenance			9	4	5
	PC4. Notify the network operations center (NOC) prior to undertaking the maintenance work as per the schedule			1	1	0
	PC5. Check power consumption pattern and report any unusual consumption to supervisor			3	1	2
	Arrange for tools and spares			PC6. Arrange necessary equipment like login cables (RJ45, RS232, Hi-speed USB etc)	2	1

		PC7: Ensure equipment specific software like NMS client is installed in pc	16	10	3	7
		PC8. Ensure availability of spare hardware equipment and raise request for in case the same are not available		1	1	0
		PC9. Utilize spares if required, and send faulty equipment for repair and replacement		2	1	1
		PC10. Follow-up with the Report & Record team/ logistics team in case of delay completion of spare requisition		1	1	0
	Conduct/ Co-ordinate maintenance activity	PC11. Conduct physical maintenance tasks like checking temperatures, routing of Ethernet and optical fibers, cables ties, earthing, equipment grouting, even distribution of cables etc.	39	15	5	10
		PC12. Conduct logical maintenance tasks like PM counter checking, obtaining daily back-ups, checking alarm status, system availability parameters, logical redundancy etc.		10	4	6
		PC13. Conduct alarm configuration testing in co-ordination with NOC team to ensure their functionality		5	3	2
		PC14. Escalate emergency/ unresolved issues according to established Company's procedure		3	2	1
		PC15. Interact with technical team for performing maintenance activities related to passive infrastructure deployed at ICT nodes or customer premises		3	2	1
		PC16. Interact with other vendors for ensuring interconnectivity uptime and lease line uptime		3	2	1
	Test effectiveness & close activity	PC17. Monitor site's alarm status in co-ordination with the NOC team to confirm effectiveness of the maintenance process	12	10	3	7
		PC18. Complete administrative jobs like site clearance, return of test equipment etc.		2	1	1
	Reports & Record	PC19. Notify all relevant parties (including NOC team, other supervisors) of the results of the routine maintenance and obtain sign off	11	4	2	2

		PC20. Reporting to supervisor once completed relating to one's role			2	2	0
		PC21. Update routine maintenance logs, activity logs and spare tracker within stipulated timelines			3	2	1
		PC22. Follow reporting procedures as prescribed by the company			2	2	0
				100		49	51
2. TEL/N6219 Perform Corrective maintenance/ Fault Management at ICT nodes	Respond to Network Alarm/ NOC instructions	PC1. Determine alarm severity, SLAs and the affected network elements	100	25	15	5	10
		PC2. Provide information to and seek advice from relevant parties in identifying the problem and cause of the alarm condition			10	4	6
	Arrange for tools and spares	PC3. Arrange necessary equipment like login cables (RJ45, RS232, Hi-speed USB etc.)		16	2	1	1
		PC4. Ensure availability of Equipment related NMS client in their PC to connect to equipment, if required			10	3	7
		PC5. Availability of spare hardware equipment. Raise request, in case the same are not available			3	2	1
		PC6. Utilize spares if required, and send faulty equipment for repair and replacement			1	1	0
	Identify & rectify faults	PC7. Login to the ICT nodes by connecting laptop with appropriate login consoles		45	6	3	3
		PC8. Based on the alarm code/ other indicators determine the fault details			10	4	6
		PC9. Carry out diagnostic tests to identify the root cause of the alarm			8	3	5
		PC10. Determine the options to rectify the fault and confirm with supervisors if			6	3	3
		PC11. Rectify network problem/ fault as per the alarm SLAs			8	3	5
		PC12. Conduct the work in compliance with the health and safety norms, and in compliance with company's procedures			5	3	2
	Test effectiveness & close activity	PC13. Escalate unresolved faults/ instances of delays in resolution as per Company's policy		7	2	1	1
		PC14. Monitor relevant alarms in co-ordination with the NOC team to confirm effectiveness of the rectification process			3	1	2

		PC15. Perform data and call testing to ensure effectiveness of the rectification process			3	1	2
		PC16. Complete administrative jobs like site clearance, return of test equipment etc.			1	1	0
	Report & Record	PC17. Notify all relevant parties (including NOC team, other supervisors) of the results of the fault rectification status and obtain sign-off		7	2	2	0
		PC18. Identify documentation to be completed relating to one's role			1	1	0
		PC19. Update activity tracker, issue logs and spare tracker within stipulated timelines and justify the fault diagnosis and rectification			3	1	2
		PC20. Follow reporting procedures as prescribed by the company			1	1	0
<b>Total</b>					<b>100</b>	<b>44</b>	<b>56</b>
3. TEL/N6220 Undertake upgrade, capacity augmentation and configuration change activities	Determine change/ configuration requirements	PC1. receive change requests (hardware upgrade, software upgrade, capacity augmentation, configuration changes) from the NOC team or supervisors		22	2	1	1
		PC2. identify criticality, and timelines for carrying out the changes			5	2	3
		PC3. develop work plan and identify dependencies if any			4	3	1
		PC4. assess the potential impact of the proposed activity and plan for possible outage condition or deferral of the activity			6	3	3
		PC5. ensure customer is informed and an approval is obtained in case of service impacting change activity			3	2	1
		PC6. ensure that Network Operating Centre (NOC) is notified prior to undertaking the activities			2	1	1
	Arrange for tools and spares	PC7. Arrange necessary equipment like login cables (RJ45, RS232, Hi-speed USB etc.)		16	2	1	1
		PC8. Ensure availability of spare hardware equipment and raise request for spares, in case the same are not available			3	2	1
		PC9. Ensure equipment specific Network Management tool or application should be installed in pc			10	3	7
		PC10. Utilize spares if required, and send faulty equipment for repair and replacement			1	1	0
			<b>100</b>				

	Carry out change and perform post change monitoring	PC11. Carry out changes carried out by the central NOC or help NOC to carry out change at local device	39	5	2	3
		PC12. Perform pre-testing and observe output of configuration changes		8	2	6
		PC13. Perform changes like traffic migrations, capacity augmentation, feature activations, routing configuration etc.		8	3	5
		PC14. Implement configurations changes like routing schemes, IP, VLAN, HLR configuration etc. as per requirements		8	3	5
		PC15. Conduct the work in compliance with the health and safety norms, and in compliance with company's procedures		3	1	2
		PC16. Monitor progress of change and notify change requestor of problems encountered if any		4	2	2
		PC17. Abort change and implement contingency plan should the change plan not be released without major disruption to network		3	1	2
	Obtain back-up, test effectiveness & close activity	PC18. Obtain back-up of ICT nodes - both pre and post-performance of change activities	16	10	4	6
		PC19. Monitor relevant alarms in co-ordination with the NOC team to confirm effectiveness of the changes performed		3	2	1
		PC20.. Perform data and call testing to ensure effectiveness of the change process		2	2	0
		PC21. Complete administrative jobs like site clearance, return of test equipment etc.		1	1	0
	Report and record	PC22. Notify all relevant parties (including NOC team, other supervisors) of the results of the change process and obtain sign-off	7	2	1	1
		PC23. Identify documentation to be completed relating to one's role		3	2	1
		PC24. Follow reporting procedures as prescribed by the company		1	1	0
		PC25. Ensure that documents are available to all appropriate authorities to inspect		1	1	0
				100	47	53

4. TEL/N6221 (Undertaking of POI)	Undertake Point of Interconnect testing	PC1. carry out physical tests of the POI as per the checklist	100	50	10	6	4
		PC2. arrange necessary equipment			10	5	5
		PC3. carry out logical tests (connectivity, redundancy, power levels etc.) as per the checklist			10	4	6
		PC4. communicate status of tests to the client team and obtain sign-off			8	4	4
		PC5. co-ordinate with Interconnect vendors for carrying out configuration changes as			12	6	6
	Report & Records	PC1. notify all relevant parties (including NOC team, other supervisors) of the results of the interconnect process and obtain sign-off		50	10	6	4
		PC2. identify documentation to be completed relating to one's role			10	5	5
		PC3. update routine issue logs, activity logs and spare tracker within stipulated timelines			10	6	4
		PC4. follow reporting procedures as prescribed by the company			10	4	6
		PC5. ensure that documents are available to all appropriate authorities to inspect			10	6	4
			400	100		52	48