GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

5G NETWORK TECHNICIAN

(Duration: One year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4.5

SECTOR – TELECOM

Directorate General of Training

5G NETWORK TECHNICIAN

(Non-Engineering Trade)

(Designed in 2023)

Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL – 4.5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091
www.cstaricalcutta.gov.in

CONTENTS

1. COURSE INFORMATION

During the one-year duration of 5G Network Technician trade a candidate is trained on professional skill, professional knowledge and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered under Professional skill subject are as below: -

The trainee will implement safe working practices, environment regulation, and housekeeping and will plan, deploy and improve wireless network. Trainee will also work with RFSIM 5G simulation Software for test and debug features, evaluate performance. Identify, select and test the 5G hardware components. The trainee will also able to setup, configure, analyze and troubleshoot different 5G Network use cases and its features. Trainee can test and tweak wireless devices, such as routers, switches, hubs, bridges, etc. Make use of enterprise monitoring tools / solutions. Implement Network policies. Classify and oversees to protect network systems. Devise and support radio frequencies (RF) link performance, reliability and quality. At the end of the training the trainee will work with Security team to evaluate threats, troubleshoot issues, and comply with appropriate security configuration standards in organizations and make use of testing and diagnostic tools to assess and modify equipment.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

5G Network Technician trade under CTS is one of the newly designed courses. The CTS courses are delivered nationwide through network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. In the Domain area (Trade Theory & Practical) impart professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainee needs to demonstrate broadly that they are able to:

- Read and interpret technical parameters/ documentation, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge & employability skills while performing the job and repair & maintenance work.
- Document the technical parameter related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as 5G Network Technician and will progress further as Senior Technician, Supervisor and can rise to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join as a technician in telecom industry for 5G Network configuration, installation and maintenance.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
3	Employability Skills	120
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

4	On the Job Training (OJT)/ Group Project	150
5	Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240

Trainees of one-year or two-year trade can also opt for optional courses ofup to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTCwill be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure are being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final**

assessment. The examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100 % is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence
(a) Marks in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • 60-70% accuracy achieved while

of an acceptable standard of craftsmanship.	undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b)Marks in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Marks in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Optical fibre splicer is responsible for ensuring efficient splicing of the optical fibre cables and supports in optical fibre installation and in carrying out fibre testing using OTDR and power meter.

Telecommunication, Technician receives instructions regarding work to be done and guides workers in installation, operation and maintenance of television, telegraph, telephone, telex system, radio, radar, sound recording and other equipment under his charge. Studies standing duty chart, sketches, blue prints etc., and determines method of work to be adopted. Calculates data by original observations or from available sources. Draws necessary stores and guides workers in correct manufacture and assembly of units, alignments, synchronizing, tuning, continuity, voltage control, output, etc. according to nature of work in which engaged. Checks work during manufacture, repair or installation and on completion for current consumption, resistance, frequency, output, leakage, performance and other factors, using instruments such as voltmeter megger, frequency meter oscillograph, resonance recorder, etc., and makes adjustments, alterations or replacements as necessary to ensure standard production and stipulated performance. May undertake complicated work to avoid mistakes and to train workers by actual demonstration.

Electronics and Telecommunications Engineering Technicians, Other include all other Electronics Technicians engaged in research and testing in various fields of electronic engineering, not elsewhere classified.

A 5G network technician is responsible for installing, configuring, maintaining, and troubleshooting 5G network systems. They work with a variety of hardware and software components, including routers, switches, antennas, and mobile devices.

Reference NCO-2015:

a) 7422.0802 – Optical Fibre Splicer
b) 3522.0100 – Telecommunication, Technician
c) 3114.9900 – Electronics and Telecommunications Engineering Technicians, Other

Reference NOS:

i. SSC/N0101
ii. TEL/N9413
iii. TEL/N9414
iv. TEL/N9412
v. TEL/N9408
vi. TEL/N9410
vii. TEL/N9405
viii. TEL/N9406
ix. TEL/N9409
x. TEL/N9407
xi. TEL/N9411
xii. TEL/N9415

4. GENERAL INFORMATION

Name of the Trade	**5G Network Technician**
NCO – 2015	7422.0802, 3522.0100, 3114.9900
NOS covered	SSC/N0101, TEL/N9413, TEL/N9414, TEL/N9412, TEL/N9408, TEL/N9410, TEL/N9405, TEL/N9406, TEL/N9409, TEL/N9407, TEL/N9411, TEL/N9415
NSQF Level	Level-4.5
Duration of Craftsmen Training	One year (1200 hours + 150 hours OJT/Group Project)
Entry Qualification	Passed 12th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF, AUTISM, SLD
Unit Strength (No. Of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	70 Sq. m
Power Norms	3.45 KW
Instructors Qualification for	
(i) 5G Network Technician Trade	B.Voc/Degree in Electronics/ Electronics and Telecommunication/ Electronics and communication/Electronics and Instrumentation Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** Diploma (Minimum 2 years) in Electronics/ Electronics and telecommunication/ Electronics and communication/Electronics and Instrumentation from AICTE/recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the Trade of "5G Network Technician" With three years' experience in the relevant field. **Essential Qualification:** Relevant Regular/ RPL variants of National Craft Instructor Certificate (NCIC) under DGT. **Note: - Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However. both of them must possess NCIC in any of**

	its variants.
(ii) Employability Skill	MBA/ BBA/ Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) OR Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills.
(iii) Minimum Age for Instructor	21 Years
List of Tools & Equipment	As per Annexure-I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES

1. Demonstrate implementation of safe working practices, environment regulation, and housekeeping. (NOS: SSC/N0101)
2. Construct, test and verify the input/ output waveforms of various analog communication link. (NOS: TEL/N9413)
3. Test various digital modulation techniques like QPSK, OQPSK, OFDM etc. using proper measuring instruments and compare the data using standard parameter. (NOS: TEL/N9414)
4. Make use of testing and diagnostic of Computer hardware networking and security to assess and modify. (NOS: TEL/N9412)
5. Implement Network policies. (NOS: TEL/N9408)
6. Demonstrate implementation and safety of fiber Crimping. (NOS: TEL/N9410)
7. Demonstrate implementation and safety of Mechanical Splicing where the fibers are precisely aligned and held in place by a self-contained assembly. (NOS: TEL/N9410)
8. Test functionality of wireless network. (NOS: TEL/N9405)
9. Work with RFSIM 5G simulation Software for test and debug features, evaluate performance. (NOS: TEL/N9406)
10. Identify, select and test the 5G Hardware Components. (NOS: TEL/N9406)
11. Setup, configure, analyze and troubleshoot different 5G Network use cases and its features. (NOS: TEL/N9406)
12. Assemble, test and troubleshoot Real time operation of 5G Smart device. (NOS: TEL/N9409)
13. Identification and working of Dual SIM interface section of 5G Smart device. (NOS: TEL/N9409)
14. Test and Tweak wireless devices, such as routers, switches, hubs, bridges, etc. (NOS: TEL/N9407)
15. Make use of enterprise monitoring tools / solutions. (NOS: TEL/N9407)
16. Classify and oversees to protect network systems. (NOS: TEL/N9408)
17. Devise and support radio frequencies (RF) link performance, reliability and quality. (NOS: TEL/N9411)
18. Work with Security team to evaluate threats, troubleshoot issues, and comply with appropriate security configuration standards in organizations. (NOS: TEL/N9412)
19. Test, verify & Maintain the various operating BTS site. (NOS: TEL/N9415)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Demonstrate implementation of safe working practices, environment regulation, and housekeeping. (NOS: SSC/N0101)	Explain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
	Check and report all unsafe situations according to site policy.
	Demonstrate necessary precautions on fire and safety hazards and report according to site policy and procedures.
	Evaluate and observe site policies and procedures in regard to illness or accident.
	Demonstrate basic first aid and use them under different circumstances.
	Explain different fire extinguisher and use the same as per requirement.
2. Construct, test and verify the input/ output waveforms of various analog communication link. (NOS: TEL/N9413)	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	Plan work in compliance with standard safety norms.
	Identify the different types of analog modulations techniques.
	Measure the analog modulated and de-modulated various sections signals using digital storage oscilloscope and spectrum analyzer.
3. Test various digital modulation techniques like QPSK, OQPSK, OFDM etc. using proper measuring instruments and compare the data using standard parameter. (NOS: TEL/N9414)	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	Plan work in compliance with standard safety norms.
	Identify the different types of digital modulations techniques.
	Measure the modulated and de-modulated various sections signals using digital storage oscilloscope
4. Make use of testing and diagnostic of Computer hardware networking and security to assess and modify. (NOS: TEL/N9412)	Test signal in different peripherals of computer hardware.
	Diagnose signal conditioning of different peripherals of computer hardware.
	Implement of Local area network and test data transfer file formatting, frame and packet size etc.
	Learn different protocols using networking.
	Learn and implement of manage layer 2, manage layer 3, POE adopter, POE devises, UTP jack panel.

	Learn different cable making using networking.
	Learn LAN testing.
	Learn and Implement wireless networking.
	Test signal in different peripherals of computer hardware.
5. Implement Network policies. (NOS: TEL/N9408)	Create an access control list (ACL) on a network router/ firewall.
	Configure port security on a network switch.
	Implement Network Address Translation (NAT) policies.
	Configure WPA3 for wireless networks / TLS 1.3 for web traffic.
	Implement Intrusion Detection and Prevention System (IDPS) policies.
	Configure QoS policies on network devices to prioritize certain types of network traffic.
	Limit the amount of bandwidth that certain types of traffic can consume.
	Implement Traffic Shaping Policies.
	Comply with relevant regulations such as HIPAA, PCI-DSS, or GDPR.
6. Demonstrate implementation and safety of fiber Crimping. (NOS: TEL/N9410)	Plan, work incompliance with standard safety norms.
	Select training platform and test setup.
	Demonstrate inspection of fiber by polishing ceramic tip with microscope, scratching, small pits in the outer rim, and small chips in the outer rim.
7. Demonstrate implementation and safety of Mechanical Splicing where the fibers are precisely aligned and held in place by a self-contained assembly. (NOS: TEL/N9410)	Plan, work incompliance with standard safety norms.
	Select training platform and test setup.
	Install and configure vibrator section in the 5G Smart device training platform.
	Demonstrate implementation of mechanical splicing by preparing the fibre, cleaving the fibre, mechanically joining the fibers and protecting the fibre.
8. Test functionality of wireless network. (NOS: TEL/N9405)	Conduct site survey to determine the signal strength/ interference/ coverage area of the wireless network.
	Develop network layout taking into consideration the coverage area and the number of users.
	Install/configure the wireless equipment based on the deployment plan.

	Test the wireless network to ensure that it meets the requirements, coverage area, and the number of users.
	Monitor the wireless network to detect weak signal strength/ network congestion/ interference.
	Troubleshoot the wireless network by resolving any detected problems or issues.
	Update firmware/ change wireless channel settings/ repositioning wireless equipment.
9. Work with RFSIM 5G simulation Software for test and debug features, evaluate performance. (NOS: TEL/N9406)	Demonstrate working on RFSIM software.
	Perform MAC/PHY operation using OAI with different MCS values using RFSIM software.
	Test transport channels with a 5G capable signal analyzer.
	Identify Transmission modes/multi-antenna support in 5G.
10. Identify, select and test the 5G Hardware Components. (NOS: TEL/N9406)	Identify hardware devices used in 5G System.
	Test hardware devices used in 5G System.
	Install hardware components used in 5G System.
	Configure hardware components used in 5G System.
	Operate hardware components used in 5G network.
11. Setup, configure, analyze and troubleshoot different 5G Network use cases and its features. (NOS: TEL/N9406)	Identify high data rates/ low latency/ massive connectivity.
	Assist in designing the 5G network architecture, including the radio access network (RAN) / core network (CN).
	Install the 5G RAN / CN equipment based on the deployment plan.
	Configure the 5G RAN /CN equipment based on the deployment plan.
	Configure the radio frequency (RF) settings/ network slicing/ security protocols.
	Test the 5G network to ensure that it meets the requirements.
	Monitor network congestion/ signal degradation/ packet loss.
	Analyze signal strength/ throughput/ latency to identify any areas of improvement.
	Use network analysis tools to troubleshoot network problems /optimize network performance.
	Troubleshoot network problems by adjusting network settings/ repositioning antennas/ upgrading network equipment.
12. Assemble, test and	Illustrate to practice the 5G Smart phone training platform with

troubleshoot Real time operation of 5G Smart device. (NOS: TEL/N9409)	safety.
	Test and verify the functionality of 5G smart phone.
13. Identification and working of Dual SIM interface section of 5G Smart device. (NOS: TEL/N9409)	Plan, work incompliance with standard safety norms.
	Select training platform and test setup.
	Install and configure operating systems and applications.
	Test the functionality of the 5G Smart device Dual SIM interface section and measure signals voltages and waveforms at different stages.
14. Test and Tweak wireless devices, such as routers, switches, hubs, bridges, etc. (NOS: TEL/N9407)	Set up a wireless router in a test environment.
	Configure network name (SSID) and password.
	Test the wireless connection to ensure it's working properly.
	Tweak the Quality of Service (QoS) settings/test the performance.
	Conduct tests using iPerf, Jperf, and Wi-Fi analyzer to measure throughput/ latency/ signal strength.
	Tweak channel selection and transmit power.
	Configure IP address and subnet mask.
	Test the connection between the two bridge points.
	Tweak encryption type and wireless channel.
	Setup/configure VLANs and port settings.
	Use diagnostic tools to identify the source of the issue.
15. Make use of enterprise monitoring tools / solutions. (NOS: TEL/N9407)	Identify enterprise monitoring tools that is best suit for specific industry.
	Set up industry monitoring tool in a test environment. Configure the tool to monitor network traffic/ server uptime/ application performance.
	Monitor network traffic to identify any bottlenecks or issues.
	Analyze the data collected by the tool to determine the cause of the issue /implement a solution.
	Troubleshoot and resolve the issue/ ensure that the server remains operational.
	Monitor the performance of critical applications using the enterprise monitoring tool.
	Generate reports on network performance/server uptime/ application performance.
	Analyze the data to identify trends and areas for improvement.

16. Classify and oversees to protect network systems. (NOS: TEL/N9408)	Create VLANs to segment the network/ prevent unauthorized access.
	Implement access control policies and monitor network traffic to ensure compliance.
	Configure firewalls to filter incoming and outgoing network traffic.
	Allow or deny traffic based on specific criteria, such as source or destination IP address.
	Monitor firewall logs to identify/ respond to security threats.
	Configure IDPS to monitor network traffic.
	Implement password policies to ensure strong passwords and regular password changes.
	Implement data encryption techniques, such as SSL or TLS, to protect data in transit.
	Use encryption tools, such as BitLocker or VeraCrypt, to encrypt data at rest.
17. Devise and support radio frequencies (RF) link performance, reliability and quality. (NOS: TEL/N9411)	Calculate the RF link budget using Link Budget Calculator.
	Adjust the transmitter power/ antenna gain/cable loss/ receiver sensitivity to optimize the RF link performance.
	Measure the signal strength and quality of a wireless communication system.
	Evaluate the signal-to-noise ratio (SNR) / the bit error rate (BER) to assess the quality and reliability of the RF link.
	Tweak antenna position or polarization, to optimize the signal strength and quality.
	Apply different interference mitigation techniques.
	Apply different techniques to mitigate multipath fading effects.
	Design and optimize the antenna for a wireless communication system.
18. Work with Security team to evaluate threats, troubleshoot issues, and comply with appropriate security configuration standards in organizations. (NOS: TEL/N9412)	Identify potential security threats to the organization's network, such as malware/ phishing attacks/ unauthorized access attempts.
	Conduct a network security audit in collaboration with a security team.
	Use tools such as vulnerability scanners/ network analyzers/ penetration testing software to identify potential security risks.
	Develop an incident response plan.

	Troubleshoot security issues, such as access control problems, configuration errors, and system failures.
19. Test, verify & Maintain the various operating BTS site. (NOS: TEL/N9415)	Familiarize component of BTS
	Demonstrate operation of BTS network elements.
	Practice on automation of alarm extension and fault finding management
	Measure the various parameters of preventive and corrective maintenance of diesel generator, power interface unit, battery bank and power plant.
	Select tools and equipment for BTS network system day to day maintenance
	Test & troubleshoot of BTS site operation as per manual

SYLLABUS FOR 5G NETWORK TECHNICIAN TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Demonstrate implementation of safe working practices, environment regulation, and housekeeping.	**Safety -** 1. Visits to workshops, labs, office, stores etc. of the institute. 2. Demonstrate safety precaution including anti-static protection. 3. Demonstrate first aid practice. 4. Demonstrate artificial respiration and practice. 5. Demonstrate electrical safety precautions.	**Safety -** • Course duration, scope, methodology and structure of the training program. • Safety in moving and shifting heavy and delicate equipments. • First aid concept. • About artificial respiration. • Electrical Safety.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Construct, test and verify the input/ output waveforms of various analog communication link.	6. Practice on communication and modulation. 7. Measure the analog modulated and de-modulated various sections signals using digital storage oscilloscope and spectrum analyser. 8. Plan work in compliance with standard safety norms.	• Communication and modulation. • Different types of analog modulations techniques.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Test various digital modulation techniques like QPSK, OQPSK, OFDM etc. using proper measuring instruments and compare the data using standard	9. Identify and test the different types of digital modulations techniques. 10. Measure the modulated and de-modulated various sections signals using digital storage oscilloscope	• Digital modulation techniques (QPSK to 256 QAM used in 5G) • Measure MIMO antennas.

	parameter.		
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Make use of testing and diagnostic of Computer hardware networking and security to assess and modify.	11. Computer basics and software installation. 12. Diagnose signal conditioning of different peripherals of computer hardware. 13. Implement of Local area network and test data transfer file formatting, frame and packet size etc. 14. Learn different protocols using networking. 15. Learn and implement of manage layer 2, manage layer 3, POE adopter, POE devises, UTP jack panel. 16. Learn different cable making using networking. 17. Learn LAN testing. 18. Learn and Implement wireless networking.	• Introduction to computer system • Introduction Windows Operating System • Introduction to DOS Command Line Interface and Linux Operating Systems • Signal conditioning of different peripherals. • Local Area Network (LAN), Testing. • Different protocols using networking. • Implement of manage layer 2, manage layer 3, POE adopter, POE devises, UTP jack panel. • Cable making using networking.
Professional Skill 95 Hrs.; Professional Knowledge 25 Hrs.	Implement Network policies.	Implementing Access Control Policies: 19. Practice on Data Communication 20. Practice on Network Protocols 21. Create an access control list (ACL) on a network router or firewall to restrict access to a particular network resource. 22. Configure port security on a network switch to limit the number of MAC addresses that can access a particular port. 23. Implement Network Address Translation (NAT) policies to restrict access to specific IP	Access Control Policies: • Data Communication and Network Protocols • Understanding the different types of access control, such as discretionary, mandatory, and role-based access control. Introduction to firewall. • How to configure access control lists (ACLs) on network devices to restrict access to specific resources. • The importance of monitoring and auditing access control policies to ensure they are effective. Security Policies: • Understanding the different

		addresses or subnets. Implementing Security Policies: 24. Configure network devices to use the latest security protocols, such as WPA3 for wireless networks or TLS 1.3 for web traffic. 25. Implement Intrusion Detection and Prevention System (IDPS) policies to monitor and prevent potential security breaches. 26. Create and enforce password policies across the network to ensure strong passwords and regular password changes. Implementing Quality of Service (QoS) Policies: 27. Configure QoS policies on network devices to prioritize certain types of network traffic, such as video conferencing or VoIP calls. 28. Implement bandwidth throttling policies to limit the amount of bandwidth that certain types of traffic can consume. 29. Use QoS policies to ensure that critical network applications receive the necessary bandwidth and latency to operate effectively. Implementing Traffic Shaping Policies: 30. Implement traffic shaping policies to prioritize or limit traffic based on specific criteria such as source IP	types of security policies, such as network security policies, device security policies, and data security policies. • How to implement security policies to prevent unauthorized access, detect and respond to security threats, and ensure data privacy and protection. • Importance of regular security assessments and audits to ensure compliance with security policies. Quality of Service (QoS) Policies: • Importance of QoS in ensuring the performance and reliability of critical network applications. • How to configure QoS policies to prioritize certain types of network traffic, such as voice or video. • The impact of QoS policies on network performance and the trade-offs between network performance and application performance. Traffic Shaping Policies: • Understanding the concept of traffic shaping and how it can be used to manage network traffic. • How to configure traffic shaping policies to prioritize or limit traffic based on specific criteria, such as source or destination IP address. • The impact of traffic shaping

		address, destination IP address, or protocol. 31. Use traffic shaping to manage bandwidth usage during peak traffic periods. 32. Implement traffic shaping to ensure that critical traffic is given priority over less important traffic. Implementing Compliance Policies: 33. Configure network devices to comply with relevant regulations such as HIPAA, PCI-DSS, or GDPR. 34. Implement policies that ensure data privacy and protection across the network, such as encryption policies for sensitive data. 35. Create and enforce acceptable use policies across the network to prevent unauthorized or inappropriate use of network resources.	policies on network performance and how to balance network performance with the needs of critical applications. Compliance Policies: • Understanding the different types of compliance regulations and standards, such as HIPAA, PCI-DSS, or GDPR. • How to implement policies to ensure compliance with regulations and standards. • The importance of regular audits and assessments to ensure ongoing compliance with policies and regulations.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Demonstrate implementation and safety of fiber Crimping.	36. Demonstrate implementation of complete crimping procedure with appropriate tools. 37. Demonstrate inspection of optical fiber by polishing ceramic tip with microscope, scratching, small pits in the outer rim, and small chips in the outer rim.	• Crimping definition and procedure of RJ45, cat6, crimping and optical fiber connectors.
Professional Skill 23 Hrs;	Demonstrate implementation and safety of	38. Demonstrate implementation of mechanical splicing by	• Configuration of vibrator section in the 5G Smart device training platform.

Professional Knowledge 7 Hrs	Mechanical Splicing where the fibers are precisely aligned and held in place by a self-contained assembly.	preparing the optical fibre, cleaving the optical fibre, mechanically joining the optical fibers and protecting the optical fibre. 39. Implement latest Splicing techniques.	• Implementation of mechanical splicing.
Professional Skill 47 Hrs.; Professional Knowledge 13 Hrs.	Test functionality of wireless network.	**Wireless Communication:** 40. Identify the wireless network elements. 41. Conduct a site survey to determine the signal strength, interference, and coverage area of the wireless network. 42. Select wireless equipment based on the requirements and the site survey results. 43. Prepare a network layout based on the deployed equipment, taking into consideration the coverage area and the number of users. 44. Prepare a deployment plan based on the network layout, considering how to install and configure the wireless equipment. 45. Install node B/BTS, eNodeB, gNodeB for 4G/5G network. 46. Test the wireless network to ensure that it meets the requirements; coverage area and data speed and call quality. 47. Observe and Monitor the wireless network to detect any problems or issues, such as weak signal strength,	**Wireless Communication** • Cellular communication. • Types of interference on wireless network. • Generations of Wireless Technology (1G, 2G, 3G, 4G, 5G, GSM, CDMA) • IMT 2020, 3GPP, 5G spectrum • Wireless network standards and protocols. • Type of antennas and use of antenna. • Wireless network equipment such as access points, routers and switches. • Understanding of network topology and configurations. • conduct a site survey to determine the coverage area, signal strength, and interference. • designing network layout considering the number of devices, users, and coverage area. • Network protocols, including DHCP, DNS, NAT and TCP/IP. • Understanding of security protocols, including WEP, WPA, and WPA2. • Configuration of network settings such as SSID,

		network congestion. 48. Troubleshoot the wireless network by resolving any detected problems or issues. 49. Demonstrate the wireless network to improve its performance and reliability.	wireless channel, and encryption type.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Work with RFSIM 5G simulation Software for test and debug features, evaluate performance.	RFSIM 5G Simulation Software 50. Practice with RFSIM software. 51. MAC/PHY operation using OAI with different MCS values using RFSIM software. 52. Test transport channels with a 5G capable signal analyzer.	RFSIM 5G Simulation Software • 5G New Radio (NR) PHY Layer • 5G MAC Layer and Schedulers • Transmission modes and multi-antenna support in 5G, node B.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Identify, select and test the 5G Hardware Components.	5G Hardware Components 53. Identify and test of hardware devices used in 5G System. 54. Install and configure hardware components used in 5G System. 55. Operate and setting of hardware components used in 5G network.	5G Hardware Components • RF Transceiver unit • Massive MIMO unit, • Integrated Radio unit • Edge Computing devices • Cable and connectors
Professional Skill 70 Hrs.; Professional Knowledge 20 Hrs.	Setup, configure, analyze and troubleshoot different 5G Network use cases and its features.	5G network: 56. Identify the requirements of a 5G network, such as high data rates, low latency, and massive connectivity. 57. Identify the types of devices that will be connected to the 5G network. 58. Demonstrate the features of 5G network architecture, including the radio access network (RAN) and core network (CN). 59. Demonstrate deployment	5G use cases and services: Education, Healthcare, Manufacturing, Industrial IoT, Gaming, Information Technology, Agriculture, Drone, Augmented Reality (AR), Virtual Reality (VR) and Video Conferencing. 5G Network Architecture: • Radio Access Network (RAN): The radio unit (RU), the distributed unit (DU), the central unit (CU). • Core Network (CN): the user

		plan for the 5G network. Analyzing 5G network: 60. Monitor the 5G network to detect any problems or issues, such as network congestion, signal degradation, or compression of coverage area. 61. Analyze the network performance metrics, such as signal strength, throughput, and latency, to identify any areas of improvement. 62. Use network analysis tools, such as Wireshark and NetScout, to troubleshoot network problems and optimize network performance. Troubleshooting a 5G network: 63. Use network analysis tools to identify the source of network problems or issues. 64. Analyze network performance metrics, such as signal strength, throughput, and latency, to determine the cause of network problems. 65. Troubleshoot network problems by adjusting network settings, repositioning antennas, or upgrading network equipment.	plane function (UPF), the control plane function (CPF). 66. Testing procedure of 5G network. security protocols used in 5G networks: • Authentication and encryption: prevention of unauthorized access. • Network slicing security: security policies and mechanisms to protect against attacks. • Radio access security: eavesdropping and jamming. • Application security: malware and phishing attacks. • Types of technical documentation: understanding the different types of technical documentation such as user manuals, installation guides, and troubleshooting guides. • Technical language and jargon: understanding technical language and jargon used in technical documentation and learning how to interpret it. • Documentation sources: understanding the different sources of technical documentation such as vendor websites, forums, and online communities. Understanding the product or service: • Root cause analysis: identifying the underlying

			cause of an issue. • Documentation: necessary steps, settings or tools used, and relevant notes. • Continuous improvement: troubleshooting guide should remain relevant and effective over time.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Assemble, test and troubleshoot Real time operation of 5G Smart device.	5G Smart Device 67. Test and verify the functionality of 5G smart phone. 68. Working with TEMS 5G Network App	5G Smart Device • Introduction to 5G Smart phone training platform. • TEMS Pocket mobile network App.
Professional Skill 23 Hrs; Professional Knowledge 7 Hrs	Identification and working of Dual SIM interface section of 5G Smart device.	69. Install and configure operating systems and applications. 70. Test the functionality of the 5G Smart device Dual SIM interface section and measure signals voltages and waveforms at different stages. 71. Demonstrate switch fault insertion in user interface section and its effects along with the possible cause and functioning of the respective signal/ voltage.	• Drawing and explanation of signal voltages and waveforms at different stages. • Introduction to CPU, Buzzer driving circuit and Buzzer. • PWM ringing driving control signal • Central Processing Unit (CPU) and given driver circuit. • Operating systems and applications in 5G smart device.
Professional Skill 70 Hrs.; Professional Knowledge 20 Hrs.	Test and Tweak wireless devices, such as routers, switches, hubs, bridges, etc.	Test and Tweak wireless devices Setting up and configuring a wireless router: 72. Set up a wireless router in a test environment. 73. Configure the router's basic settings such as network	Test and Tweak wireless devices Setting up and configuring a wireless router: • Introduction to Wifi bands. • Understanding basic wireless router settings, such as SSID, password, and DHCP.

		name (SSID) and password. 74. Test the wireless connection to ensure it's working properly. 75. Tweak the router's advanced settings, such as Quality of Service (QoS) settings, and test the performance. Testing the performance of a wireless network: 76. Create a test plan for measuring the performance of a wireless network. 77. Conduct tests using tools such as iPerf, Jperf, and Wi-Fi analyzer to measure throughput, latency, and signal strength. 78. Tweak the network settings, such as channel selection and transmit power, and re-run the tests to see how the changes affect performance. Configuring a wireless bridge: 79. Set up a wireless bridge in a test environment. 80. Configure the bridge's settings, such as IP address and subnet mask. 81. Test the connection between the two bridge points to ensure it's working properly. 82. Tweak the bridge's settings, such as encryption type and wireless channel, and test the connection again to see how the changes affect performance. Setting up and configuring a wireless switch:	• Familiarizing with advanced settings, such as QoS and port forwarding Testing the performance of a wireless network: • Knowing how to measure wireless network performance, including throughput, latency, and signal strength • Understanding how to use tools like iPerf, Jperf, and Wi-Fi analyzer to conduct wireless network tests. Configuring a wireless bridge: • Understanding the purpose and benefits of a wireless bridge. • Knowing how to configure a wireless bridge and adjust its settings for optimal performance. Setting up and configuring a wireless switch: • Knowing the difference between a wireless switch and a wireless router. • Familiarizing with basic and advanced wireless switch settings, including VLANs and link aggregation. Troubleshooting wireless connectivity issues: • Knowing how to diagnose wireless connectivity issues, including weak signals and interference. • Understanding how to adjust wireless product settings to resolve connectivity issues, such as

		83. Setup and configure the Wireless switch's basic settings such as VLANs and port settings. 84. Test the switch's functionality by connecting devices to it and verifying connectivity. Troubleshooting wireless connectivity issues: 85. Set up a test environment with a simulated wireless connectivity issue, such as a weak signal or interference 86. Use diagnostic tools, such as ping and traceroute, to identify the source of the issue.	changing the wireless channel or transmit power.
Professional Skill 70 Hrs.; Professional Knowledge 20 Hrs.	Make use of enterprise monitoring tools / solutions.	Enterprise monitoring tools 87. Choose and Familiarize with popular enterprise monitoring tools. 88. Work with the features, benefits, and limitations of monitoring tool to determine which one is best. 89. Choose an enterprise monitoring tool and set it up in a test environment. 90. Configure the tool to monitor key performance indicators (KPIs) such as network traffic, server uptime, latency, MTTR restore and application performance. 91. Operate the enterprise monitoring tool to monitor network traffic and identify any bottlenecks or issues. 92. Observe the data collected	Enterprise monitoring tools • Network monitoring: Understanding the key concepts and protocols used in network monitoring, such as Simple Network Management Protocol (SNMP), NetFlow, and packet sniffing. • Server monitoring: Understanding server architecture and hardware components such as CPUs, memory, and storage. Familiarity with server operating systems and services such as DNS, DHCP, and Active Directory. Understanding server performance metrics such as CPU usage, memory usage, and disk I/O. • Application monitoring:

		by the tool to determine the cause of the issue and implement a solution. 93. Monitor server uptime by using the enterprise monitoring tool. 94. Troubleshoot and resolve the issue, and ensure that the server remains operational. 95. Monitor the performance of critical applications using the enterprise monitoring tool. 96. Identify and optimize performance issues and optimize the application's performance. 97. Generate reports on network performance, server uptime, and application performance. 98. Analyze the data to identify trends and areas for improvement. 99. Continuously review and optimize the configuration of the enterprise monitoring tool to ensure that it is effectively monitoring the network, servers, and applications. 100. Keep up-to-date with new features and capabilities of the tool to maximize its effectiveness. 101. Use of SISCO network, NS3 and Google GNS for network monitoring.	Understanding the key concepts of application monitoring, such as transactions, requests, and response times. Familiarity with application servers and web servers such as Apache, Tomcat, and IIS. • Understanding application performance metrics such as response time, throughput, and error rates. • Performance tuning: Understanding the key concepts of performance tuning, Familiarity with performance tuning tools such as JMeter, ApacheBench, and LoadRunner. • Incident management: Understanding the key concepts of incident management such as ticketing systems, service level agreements, and escalation procedures. Familiarity with ITIL best practices for incident management. • Continuous improvement: Understanding the key concepts of continuous improvement such as process improvement, root cause analysis, and the Plan-Do-Check-Act (PDCA) cycle.
Professional Skill 95 Hrs.;	Classify and oversees to protect network systems.	Network Segmentation: 102. Identify different network segments based on their	Network Security Architecture: • Understanding the principles of network security

Professional Knowledge 25 Hrs.		importance and sensitivity. 103. Create VLANs to segment the network and prevent unauthorized access. 104. Implement access control policies and monitor network traffic to ensure compliance. Firewall Configuration: 105. Configure firewalls to filter incoming and outgoing network traffic. 106. Create rules to allow or deny traffic based on specific criteria, such as source or destination IP address. 107. Monitor firewall logs to identify and respond to security threats. Intrusion Detection and Prevention: 108. Implement intrusion detection and prevention systems (IDPS). 109. Configure IDPS to monitor network traffic and alert administrators of any suspicious activity. 110. Prepare incident response plans to respond to security incidents and minimize their impact. User Management: 111. Create user accounts with appropriate access levels and permissions. 112. Configure password policies to ensure strong passwords and regular	architecture and its importance in protecting network systems. • Different types of security threats, such as malware, phishing attacks, and denial-of-service attacks. • Learning about different security measures, such as firewalls, intrusion detection and prevention systems, and encryption. Risk Management: • Understanding the principles of risk management and its importance in protecting network systems. • Potential risks to network systems, such as human errors, system failures, and security breaches. • Learning about different risk assessment techniques, such as vulnerability assessments and penetration testing. Access Control: • Understanding the principles of access control and its importance in protecting network systems. • Different types of access control, such as discretionary access control, mandatory access control, and role-based access control. • Learning about different access control mechanisms, such as access control lists, passwords, and biometric authentication.

		password changes. 113. Monitor user activity to detect and prevent unauthorized access and data breaches. Data Encryption: 114. Identify sensitive data that needs to be protected and classify it based on its importance. 115. Implement data encryption techniques, such as SSL or TLS, to protect data in transit. 116. Use encryption tools, such as BitLocker or VeraCrypt, to encrypt data at rest.	Incident Response: • Understanding the principles of incident response and its importance in protecting network systems. • Developing incident response plans to respond to security incidents and minimize their impact. • Learning about different incident response techniques, such as containment, eradication, and recovery. Compliance: • Understanding the importance of compliance with regulations and standards, such as the General Data Protection Regulation (GDPR) and the Payment Card Industry Data Security Standard (PCI DSS). • Learning about different compliance requirements and best practices for meeting them, such as data classification, encryption, and audit logging. • Communication of digital transmission.
Professional Skill 70 Hrs.; Professional Knowledge 20 Hrs.	Devise and support radio frequencies (RF) link performance, reliability and quality.	RF Link Budget Calculation: 117. Calculate the RF link budget for a wireless communication system using tools such as Link Budget Calculator. 118. Adjust the different parameters of the system, such as the transmitter power, antenna gain,	• RF link performance factors: Understanding the factors that affect RF link performance, such as signal strength, noise, interference, attenuation, fading, and multipath. • RF link reliability: Understanding the factors that affect RF link reliability,

		cable loss, and receiver sensitivity, to optimize the RF link performance. 119. Analyze the results and evaluate the impact of changes in the parameters on the RF link quality and reliability. Signal Strength and Quality Measurement: 120. Measure the signal strength and quality of a wireless communication system using tools such as Wi-Fi Analyzer or Spectrum Analyzer or net velocity. 121. Evaluate the signal-to-noise ratio (SNR) and the bit error rate (BER) to assess the quality and reliability of the RF link. 122. Tweak the system parameters, such as the antenna position or polarization, to optimize the signal strength and quality. 123. To check the RF signal strength, the VSWR of the RF signal is check while connecting with the GSM jumper cable. For 5G the minimum VSWR is 1.0. Interference Analysis and Mitigation: 124. Analyze the interference sources in a wireless communication system using tools such as	such as antenna placement, orientation, polarization, and diversity, as well as how to mitigate issues like signal loss and dropouts. • RF link quality: Understanding the metrics used to measure RF link quality, such as signal-to-noise ratio (SNR), bit error rate (BER), and packet loss rate (PLR), as well as how to optimize these metrics for better overall performance. • Mobile KPS measurement, net monitor tool. • RF link planning: Understanding the process of planning an RF link, including site surveys, link budget calculations, and antenna selection. • RF link optimization: Understanding how to optimize RF links through techniques such as channel bonding, beamforming, and MIMO. • VSWR stands for Voltage Standing Wave Ratio. Physical Meaning of VSWR, Reflection Coefficient, Reflected Power, and s11 • RF link troubleshooting: Understanding how to troubleshoot common issues with RF links, such as interference, poor signal quality, and connectivity problems. • RF link security:

		Spectrum Analyzer or Wireshark. 125. Identify the sources of interference, such as other wireless networks, Bluetooth devices, or microwave ovens. 126. Apply different interference mitigation techniques, such as changing the channel or frequency, or using interference filters, to improve the RF link performance and reliability. Multipath Fading Analysis: 127. Analyze the multipath fading effects on a wireless communication system using tools such as Channel Simulator or Ray Tracing. 128. Identify the sources of multipath fading, such as reflections, diffractions, or scattering. 129. Apply different techniques to mitigate multipath fading effects, such as diversity reception or equalization. Antenna Design and Optimization: 130. Optimize the antenna for a wireless communication system using tools such as Antenna Design Software. 131. Adjust the different parameters of the antenna, such as the	Understanding the security risks associated with RF links, such as eavesdropping, jamming, and unauthorized access, as well as how to implement security measures such as encryption, authentication, and access control.

		antenna type, shape, size, and material, to optimize the RF link performance and reliability. 132. Analyze the results and evaluate the impact of changes in the antenna parameters on the RF link quality and reliability.	
Professional Skill 70 Hrs.; Professional Knowledge 20 Hrs.	Work with Security team to evaluate threats, troubleshoot issues, and comply with appropriate security configuration standards in organizations.	**Work with Security team to:** Identifying security threats 133. Identify potential security threats to the organization's network, such as malware, phishing attacks, and unauthorized access attempts. 134. Prepare a plan for responding to these threats, including mitigation strategies and incident response procedures. Network security auditing: 135. Conduct a network security audit in collaboration with a security team to identify vulnerabilities and weaknesses in the network infrastructure. 136. Use tools such as vulnerability scanners, network analyzers, and penetration testing software to identify potential security risks. Troubleshooting security issues: 137. Troubleshoot security issues, such as access control problems,	• Introduction to 5G Security • Understanding network security threats: An overview of different types of network security threats such as malware, phishing, denial-of-service attacks, etc. • Network security tools and techniques: An overview of different network security tools and techniques such as firewalls, intrusion detection systems, encryption, etc. • Security configuration standards: Understanding security configuration standards such as NIST, ISO, CIS, etc., and their relevance to network security. • Security policies and procedures: Understanding the importance of security policies and procedures, and their role in maintaining network security. • Threat intelligence: Understanding the role of threat intelligence in network security, and how to use threat intelligence to prevent security incidents.

		configuration errors, and system failures. 138. Use tools such as security information and event management (SIEM) systems, log analyzers, and intrusion detection systems to identify and respond to security incidents.	• Risk assessment and management: Understanding the importance of risk assessment and management in network security, and how to perform a risk assessment and develop a risk management plan. • Compliance auditing: Understanding the importance of compliance auditing, and how to conduct compliance audits to ensure that network security policies and procedures are being followed.
Professional Skill 23 Hrs.; Professional Knowledge 7 Hrs.	Test, verify & maintain the various operating BTS site.	Passive Infrastructure on BTS site 139. Component familiarization of BTS. 140. Operation of BTS network elements 141. Working with Automation of Alarm extension and fault management. 142. Preventive and corrective maintenance of Diesel Generator, Power interface Unit, Battery Bank, and Power Plant. 143. Practice on Troubleshooting Tips.	Passive Infrastructure on BTS site • BTS site network elements • Diesel Generator • Power Interface Unit • Power Plant • Battery Bank • Maintenance Check List
Project Work/ OJT: 150 Hours			

Note: *The duration of Professional skills (Trade practical) and Professional knowledge (Trade theory) are indicative only. The Training Institute has the flexibility to adopt suitable training duration for effective training.*

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in/ www.dgt.gov.in

ANNEXURE-I

List of Tools & Equipment			
5G NETWORK TECHNICIAN (for batch of 24 Candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Connecting screw driver	100 mm	24 Nos.
2.	Neon tester	500 V.	24 Nos.
3.	Screw driver set	Set of 5	24 Nos.
4.	Insulated combination pliers	150 mm	24 Nos.
5.	Insulated side cutting pliers	150 mm	24 Nos.
6.	Long nose pliers	150 mm	24 Nos.
7.	Soldering iron	25W 240V	24 Nos.
8.	Electrician knife		24 Nos.
9.	Tweezers	100 mm	24 Nos.
10.	Digital Multimeter	4000 Counts, LCD Display 3 ¾ Digital multimeter to test AC/DC Voltage and Current, Resistance, Temperature and Transistor (hhFE) , duty cycle , Diode and Continuity measurement Data Hold.	24 Nos.
11.	Soldering Iron Changeable bits	15W	24 Nos.
12.	De-soldering pump		24 Nos.
B. LIST OF TOOLS			
13.	Crimping tool(pliers)		2 Nos.
14.	Soldering Iron	25W	6 Nos.
15.	Magneto spanner set		2 Nos.
16.	Screwdriver	150mm	4 Nos.
17.	Steel rule	150mm	2 Nos.
18.	Scriber straight	150mm	2 Nos.
19.	Soldering Iron	240W	1 No.
20.	Allen key set	set of 9	2 Nos.
21.	Tubular box spanner	Set of 6 nos.	1 No.
22.	Magnifying lenses	75mm	3 Nos.
23.	Continuity tester		6 Nos.
24.	Soldering iron	10W	6 Nos.
26.	Scissors	200mm	1 No.
C. TOOLS AND EQUIPMENT: (Computer Hardware - Installation and Maintenance)			
28.	Server Computer		1 No.

29.	Desktop Computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	20 Nos.
30.	Laptop, Notebook for demonstration	Latest configuration	04 Nos.
31.	Laptop, Notebook		12 Nos.
32.	Intel Mobile Desktop based PC with LCD monitor		01 No.
33.	Printers: LaserJet, DeskJet, passbook, MFD		01 each
34.	Network Printer		01No.
35.	5KVA online UPS		As required
37.	LCD/DLP Projector/Interactive Smart Board		01No.
38.	Power Meter		02Nos.
40.	Computer Toolkits		06Nos.
48.	Pen Drives		4 Nos.
53.	Anti static pads		4 Nos.
54.	Anti static wrist wraps		4 Nos.
58.	External Hard Disk		2Nos.
62.	Card Reader		2Nos.
63.	Game video card		2Nos.
64.	Web Cam		2Nos.
65.	Surround sound speakers		2Nos.
66.	Different types of memory cards		2 Nos. each
67.	Laptop kits		12Nos.
68.	Laptop spares	Cabinet with display, memory, hard disk, battery pack, keyboard membrane, chargers	As required
69.	SMPS Trainer kit	The instrument should have following features : In depth elucidation of Switching Transformer, which is one of the most important component of SMPS. Facility to connected Variac with the kit Fault identification feature enabled. Switching Transformer Input : 320 V DC switching at	2 Nos.

		132 KHz, Output 30 V AC (approx). Fuse 500 mA (spare fuse should be provide with fuse socket and detachable mains cord)	
70.	UPS Trainer kit	In depth explanation of PWM switching technology, which is one of the most important feature of UPS. Various test points should provide so that student can easily measures the voltages of different sections.	2 Nos.
72.	Poster or debugging card		4 Nos.
73.	SMPS Tester		4 Nos.
75.	5G Smart Phone Training Kit	On board sections: Touch display, Dual SIM interface, user interface, Battery charging circuit, Power management unit, and RF Spectrum Analyzer module. Sensors: Accelerometer, Fingerprint sensor Gyro sensor, Geomagnetic sensor, Virtual light sensor etc. User interface: Buzzer, Vibrator, Mic, Speaker, Hands free port, and display LEDs Test points: More than 45 nos. Switched fault: more than 25 nos. Power Supply : 230V AC, 50/60 Hz Should be provided with learning & simulation software.	4 Nos.
76.	QPSK, OQPSK and DQPSK Training Kit	Should support QPSK, OQPSK, DQPSK, modulation & demodulation techniques, should have Internal Data Generator, Data pattern: 64, 32, 16, 8 bits, Frequency (in KHz):16, 8, 4, 2. Sine & cosine carrier signal, 8MHz crystal frequency. More than 20	4 Nos.

		indicators and 50 test points. Should be provided with learning & simulation software.	
77.	OFDM Training System	Built in real-time data acquisition system with time domain signal analysis, two channel Additive White Gaussian Noise Generator, 10 bitI & Q Channel DACs, programmable data rate through software, supports 64 points IFFT & FFT with Baseband QPSK modulation & Demodulation Techniques Mains Supply : 110-220 V AC, 50/60Hz, USB interface, LED indications Should be provided with learning & simulation software.	4 Nos.
78.	Fiber Optics Connecterization Kit	To make the optically perfect joint in optical fiber. Should have following Crimp Tool , Triple Hole fiber Optics Stripper, Diamond Scribe, Polish films 5u, 1u, 0.3u, and (3 each): 1 Pack, 2 part Epoxy : 3 Packs., Syringe & Needle : 3 Packs., Polishing Disc (ST) : 1 No., Polishing pad : 1 No., Work Mat : 1 No., Glass Plate : 1 No., Measuring Scale : 1 No., Cable Markers : 1 Packs, Knife : 1 No., Tweezers : 1 No., Screw driver : 1 No., Marker Pen : 1 No., Tissue Papers : 1 Pack., Alcohol : 1 Pack., Foam Swabs : 1 Pack., Piano Wire : 1 No.,X100 Microscope : 1 No., Continuity Tester : 1 No., Connectors : 10 Nos., Glass fiber Cable 62.5/1 25 : 10 Meters., VIP Carrying Case : 1	4 Nos.

		No., Storage Boxes : 6 Nos., Mechanical Splice M/C & Key : 1 Set., Mechanical Splice : 3 Nos.	
	Spectrum Analyzer	6 GHZ	1
	DSO		4 Nos.
	Optical Pulse meter		2 Nos.
	LANTester		4 Nos.
	Fibre optic cable		As required
	WiFi Scope		2 Nos.
	PC based DSO		1 No.
	OTDR		1 No.
	Splicing techniques tools		1 No.
	QAM Trainer		1 No.
	MIC Trainer		1 No.
D. SOFTWARE			
75.	Windows Server Operating System		2 licenses
76.	Windows Operating System		20 licenses
77.	Linux Operating System		2 Nos.
78.	Network Management Software	20 user licence	1No.
79.	MS Office		2 Nos.
80.	Antivirus software		20 Nos.
81.	Data recovery software		2 Nos.
	Technology Learning Software for Wireless Communication	Cellular Fundamentals, Frequency Reuse, Architecture, Interference, Path Environment, Coverage and Capacity. GSM Network, Logical Channel, multiplexing scheme, GSM Management, Call Management, Call setup, call release, Handover, GSM Security. CDMA: Multiple Access Techniques, CDMA Transmitter, Working, Spread Spectrum, DSSS, Frequency Hoping, Pseudo	10 licenses

		Random Code, Power Control, Handoff Process, Rake Receiver, Capacity of CDMA with simulations, animations, theory, multiple choice questions, notes and question bank.	
	Technology Learning Software for Digital Communication	To understand concepts of digital communication Signals basics, Sampling & Reconstruction, Time Division Multiplexing, Pulse Code Modulation / Demodulation, Linear / Adaptive Modulation, Line Coding and Data Formatting, Carrier Modulation Techniques, Digital Modulation Techniques: QPSK, DQPSK, OQPSK, Pi/4 QPSK, 8-QAM, 16-QAM, MSK Modulation with simulations, animations, theory, multiple choice questions, notes and question bank.	10 licenses
E. FURNITURE AND OTHER EQUIPMENTS			
82.	Computer Tables		20Nos.
83.	Computer Chairs		24Nos.
85.	Class room chairs		24 Nos.
86.	Air conditioners (optional)		As required
87.	Scanner		1 No.
88.	Modem		1 No.
90.	Broadband Internet connection		1 No.
91.	Fire fightingequipments	Arrange all proper NOCs and equipments from Municipal/Competent authorities.	
F. COMPUTER NETWORKING			
94.	Wireless Access Point		6Nos.
95.	Router		2 Nos.
98.	Network Training System	This training system should help to understanding of Local Area Network (LAN) including fundamentals of networking. It should assist for knowledge of all network layers, cable designing and building of a complete network of computers. Students can study	2 Nos.

		of various topologies using different standards given by IEEE with actual connections made in different topologies and data can be transferred. It should have provision to understand protocols, topologies used in networking, measurement of error rate, throughput and effect of errors on protocols. It should have PC to PC communication, Star topology, Ring topology.	
99.	LAN Protocol Simulation and Analyser Software	Student can study Star, Bus & Ring selection, Protocols: CSMA /CD, CSMA /CA, Stop N Wait, Go back to N, Selective repeat, Sliding Window, Token Bus, Token Ring, Packet size: 128, 256, 512, 1024, 2048, 4096, 8192, 16384 Inter Packet delay: 1000 – 5000 ms.Indication of computer name, IP address, MAC address, Port number, status of network, Network & protocol analysis like Indication of packet serial number.	2 Nos.
100.	Network and Internet security training kit	This training setup should help to students to understand Multimedia Computer and peripherals with artificial switch faults, to study the signals on various points 50MHz, 4 ch. Digital Storage Oscilloscope with more than 20 mpts memory should be available with this setup. Wireless Local Area Network, Managed Layer 2 and 3 Ethernet Switch 8 port--1 no each. Switch with POE ports-2 no.POE adapters-2no, Network Camera-1 no. Antivirus license Software for 1 year -2no. Fiber	2 Nos.

		Optic cable with convertor, Media Converter - 2No. AC Supply: MCB with AC supply switches for safety purpose Horizontally aligned and sufficient legroom. It should provide with Power indicator & ON/OFF Control and Circuit Breaker of rating 3 Amp with ON/OFF Control and along with over load protection LAN Tester. Crimping Tool and RJ45 Connector with CAT6 cable.	
109.	SC Couplers		12Nos.
111.	RJ	45connectors	As required
112.	Multimeter	4 ½- digit large LCD displays with back light max. Reading: 1.9999, Voltage measurement up to 1000 VDC and 750V AC,DC, AC Current up to 20A,ACV frequency Response: 50KHz,Frequency, Resistance, Capacitance measurement, Diode check and Continuity test.	2Nos.
113.	NVR		1 No.
114.	DIN Male Connector for 7/8 Super Flex Cable	Frequency Range- DC(7.5 GHz),Impedance-50 Ohm, Working Voltage: 2700V RMS,50Hz,at sea level, Dielectric Withstanding: 4000V rms,50Hz,at sea level, Material- Brass	10 Nos.
115.	Digital/Analog VSWR Meter for Antenna Tester RF Cable	Application Type: Radio Frequency, Display Size: 7 INCH, Input Voltage: 12V 2.5Amp, Operation: VSWR Testing, Return Loss, Inserson loss, Fault detection	1 No.
G. RAW MATERIAL			
122.	PCB, solder flux etc& electronic components		As required
123.	Wires, cables Plug sockets switches of various types and other consumables		As required

124.	Resistors, Capacitors, Inductors, Diodes, LED, Transistors, Thyristors, ICs etc.		As required
126.	Various types of Button Cells		As required
127.	Dry Cell		As required
128.	Hand Brush		As required
129.	Silicon grease		As required
130.	Heat sink agent		As required
132.	Cartridges for printer		As required
137.	3 Pin Power Chord		As required
139.	Flat Cable		100 meters
144.	Pen Drives	8 GB	4Nos.
149.	Anti static wrist wraps		As required
150.	Soldering wire and paste		As required
154.	RJ-11 connector		As required
155.	BNC connector, T connector, terminator		As required
156.	Keystone jack		As required
163.	LAN Card		04 Nos.
164.	Wi-Fi LAN Card both PCI and USB		02 Nos. each

NOTE:

1. Internet facility is desired to be provided in the class room.

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्