COMPUTER NETWORKS INSTALLATION

UNIT CODE: 0713 441 09A

TVETCDACC UNIT CODE: ENG/CU/TLE/CR/03/5/MA

Relationship to Occupational Standards

This unit addresses the unit of competency: Install Computer Networks

Duration of Unit: 160 hours

Unit Description

This unit specifies competencies required for installing computer networks. These include: conducting computer network site preparation, preparing computer network technical drawing, carrying out computer network structured cabling and installing SOHO networks

Summary of Learning Outcomes

By the end of the unit the trainee should be able to:

S/NO	LEARNING OUTCOME	DURATION (HRS)
1.	Conduct Computer Network Site preparation	10
2.	Prepare Computer Network Technical Drawings	40
3.	Carry out Computer Network Structured Cabling	60
4.	Install SOHO networks	50
	TOTAL HOURS	160

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods

1. Conduct Computer Network Site preparation	1.1.Introduction to network types 1.1.1. LAN 1.1.2. MAN 1.1.3. WAN 1.2.Introduction to site survey 1.2.1. Definition of site survey 1.2.2. Terms used in site survey 1.2.2.1.Site Survey 1.2.2.2.Network Topology 1.2.2.3.Coverage Area 1.2.2.4.Bandwidth 1.2.2.5.Latency 1.2.3. Components of site survey 1.2.3.1.Physical Layout Assessment 1.2.3.2.Coverage Area Analysis 1.2.3.3.Capacity Planning 1.2.3.4.Power and Cabling Requirements 1.2.3.5.Security 1.2.4. Tools and equipment required during site survey 1.2.4.1. Basic tools: I. Cable strippers, II. crimping tool, III. wire cutter, IV. screwdriver set, V. pliers, VI. cable tester 1.2.4.2.Network installation tools: I. Cable puller, II. fish tape, III. cable labels and markers, IV. cable ties, V. punch down tool 1.2.4.3.Network testing equipment: I. Network analyzer, II. power meter, III. protocol analyzer 1.3. Network site preparation and planning 1.3.1. Site requirements assessment	1. Practical assessment 2. Project 3. Written assessment 4. Observation 5. Oral questioning 6. Portfolio of evidence 7. Third party report

	1.3.1.1.Number of workstations and devices 1.3.1.2.Required bandwidth and data rates 1.3.1.3.Security requirements 1.3.1.4.Future expansion plans	
2. Prepare Computer Network Technical Drawings	2.1.Network topology diagram 2.1.1. Types of network topology: 2.1.1.1.Star 2.1.1.2. Bus 2.1.1.3. Ring 2.1.1.4.Mesh 2.1.1.5. Hybrid 2.1.2. Components of network topology: 2.1.2.1.Routers 2.1.2.2.Workstations 2.1.2.3. Switches 2.1.2.4.Hubs 2.1.2.5.Access point. 2.1.2.6. Servers 2.1.3. Physical and logical topology 2.2.Site floor plan and layout 2.3.Cabling diagram 2.3.1. Structure cabling representation 2.3.2. Cable routing 2.3.2.1. Horizontal 2.3.2.2. Vertical 2.3.3. Patch panel and wall jack mapping 2.3.4. Cabling diagram components: 2.3.4.1.Ethernet cables, 2.3.4.2. Fiber optic cable 2.3.4.3.Coaxial cables 2.3.4.4. Patch panel 2.3.4.5.Wall jacks 2.3.4.6. conduits	1. Practical assessment 2. Project 3. Written assessment 4. Observation 5. Oral questioning 6. Portfolio of evidence 7. Third party report

	2.3.5. Rack elevation diagram: 2.3.5.1. Arrangement of equipment in rack 2.3.5.2.Labelling and color code standards	
3. Carry out Computer Network Structured Cabling	3.1.Computer network structured cabling 3.1.1. Definition of Structured Cabling 3.1.2. Components of structured cabling 3.1.2.1.Patch Panels 3.1.2.2.Cable Trays 3.1.2.3.Conduits and raceways 3.1.2.4.Switches & Routers 3.1.2.5.Network Cabinets and racks 3.1.2.6.Patch cords and jumpers 3.2.Introduction to Network media 3.2.1. Analog and Digital data 3.2.2. Analog and Digital Signals 3.2.3. Line Coding 3.2.4. Multiplexing 3.2.5. Types of network cables and their capacities 3.2.5.1.Twisted pair I. UTP II. STP 3.2.5.2.Coaxial cable I. RG 6, II. RG 11 III. RG 59 3.2.5.3.Fibre optic cable I. single mode II. multimode 3.2.6. Cable standards and application 3.2.6.1.Ethernet cable standards 3.2.6.2.Coaxial cable standards 3.2.6.3.Fiber optic cable standards 3.3.Cable installation techniques 3.3.1. Cable routing and management 3.3.2. Cable path planning 3.3.3. Distance limitation 3.3.4. Securing and protecting cables 3.3.5. Environmental consideration 3.4.Termination Techniques 3.4.1. Twisted Pair Cable Termination	1. Practical assessment 2. Project 3. Written assessment 4. Observation 5. Oral questioning 6. Portfolio of evidence 7. Third party report

	3.4.1.1. Attaching RJ45 connectors using crimping tools. 3.4.1.2. Terminating cables on patch panels and keystone jacks 3.4.2. Fiber Optic Termination 3.4.2.1. Fusion splicing and mechanical splicing. 3.4.2.2. Attaching fiber connectors (LC, SC). 3.4.3. Patch panel and Equipment Termination 3.4.3.1. Connecting terminated cables to patch panels and switches. 3.4.3.2. Routing and securing within cabinets. 3.4.3.3. Labeling standards and documentation 3.4.4. Introduction to IP addressing 3.4.5. IPv4 and IPv6 3.4.6. Sub-netting 3.4.7. Private and public IP addressing 3.4.8. DHCP and static IP	
4. Install SOHO network	4.1. Install SOHO network 4.1.1. Introduction to network models 4.1.1.1. OSI model 4.1.1.2. TCP/IP model 4.1.1.3. Comparison of network models. 4.1.2. Introduction to network protocols 4.1.2.1. TCP/IP protocol 4.1.2.2. UDP protocol 4.1.2.3. HTTP protocol 4.1.2.4. FTP protocol 4.1.2.5. SMTP 4.1.2.6. DNS 4.1.2.7. Roles of protocols in network communication 4.1.3. Definition of SOHO 4.1.4. Components of a SOHO network 4.1.4.1. Router 4.1.4.2. Modem	1. Practical assessment 2. Project 3. Written assessment 4. Observation 5. Oral questioning 6. Portfolio of evidence 7. Third party report

	4.1.4.3.Switch 4.1.4.4.Ethernet 4.1.4.5.Firewall 4.1.5. Steps in installing SOHO network 4.1.5.1.Setting up internet access 4.1.5.2.Configuring router 4.1.5.3.Setting up wired and wireless connections 4.1.5.4.Testing and troubleshooting network connectivity 4.1.5.5.Documentation	

Suggested Methods of Instruction

1. Practical
2. Project
3. Demonstration
4. Group discussion
5. Direct instruction
6. Field trips

Recommended Resources for 25 trainees

S/No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio** (Item: Trainee)
A	**Learning Materials**			
1.	Training Manuals	Manuals on network installation, covering topology, configuration, and testing.	5 copies	1:5
2.	Networking Simulators	Software such as Cisco Packet Tracer or GNS3	Enough	-
3.	Network Configuration Guides	Documentation for setting up routers, switches, and firewalls.	5 copies	1:5
4.	Topology Diagrams	Pre-designed network layout diagrams for training exercises.	5 copies	1:5
5.	Safety Guidelines	OSHA-compliant guidelines for handling	5 copies	1:5

		electrical and networking equipment safely.		
6.	Reference Books	Books such as Networking All-in-One For Dummies or CompTIA Network+ Certification Guide.	Online access	-
7.	Tutorial Videos	Step-by-step video tutorials on cable termination, network setup, and troubleshooting.	Enough	-
8.	Power point presentations	For trainer's use	Enough	-
C	**Learning Facilities & infrastructure**			
9.	Lecture/theory room	$60m^2$	1	1:25
10.	Workshop	$160m^2$	1	1:25
11.	Computers and laptop with internet access	Processor: Intel Core i5/i7 or equivalent RAM: 8GB or higher Storage: 256GB SSD or higher	10 pcs	1:3
12.	Projectors	At least 3000 lumens With HDMI and VGA ports	1	1:25
D	**Materials, tools and equipment**			
13.	Ethernet Cables	Cat6a cables	200 m	8 m:1
14.	Patch Cords	Pre-terminated patch cables with RJ45 connectors, Cat6 standard, lengths from 0.5m to 5m.	50 pcs each category	2:1

15.	Cable Management Supplies	Velcro straps, cable ties, cable sleeves	Enough	-
16.	RJ45 Connectors	Compatible with Cat5e/Cat6 cables.	1000 pcs	40:1
17.	Keystone Jacks	Ethernet jacks for wall plate installation; Cat6 or higher standard.	500 pcs	20:1
18.	Network Racks	9U and 12U network racks with mounting brackets and lockable glass doors.	5 pcs	1:5
19.	Faceplates	Single and dual-port wall plates for Ethernet jack installation.	200 pcs each category	8:1
20.	Labeling Supplies	Label tapes and markers.	2 pcs	1:13
21.	Network Switches	Managed and unmanaged switches, 8-port and 24-port models with Gigabit Ethernet.	4 pcs each category	1:6.25
22.	Routers	Wireless and wired routers with dual-band (2.4 GHz/5 GHz) support and firewall capabilities.	10 pcs	1:3
23.	Access Points	Wi-Fi 6 or Wi-Fi 5 APs with PoE support for wireless network coverage.	5 pcs	1:5
24.	Servers	Entry-level servers for network hosting, with Intel Xeon processors and at least 16GB RAM.	1 pc	1:25
25.	Network Interface Cards	PCIe-based Ethernet adapters supporting Gigabit or 10Gbps speeds.	5 pcs	1:5
26.	Patch Panels	24-port and 48-port Cat6 patch panels for central cable management.	10 pcs	1:3

27.	Modems	DSL, cable, or fiber modems for internet access.	5 pcs	1:5
28.	UPS Units	Uninterruptible power supplies with minimum 500VA capacity for backup power.	1 pc	1:25
29.	Crimping Tool	Compatible with RJ45 connectors.	5 pcs	1:5
30.	Cable Tester	Multi-function cable tester with capability to verify continuity, pin configuration, and speed compatibility.	5 pcs	1:5
31.	Punch-Down Tool	Capable of terminating wires into keystone jacks and patch panels; includes spare blades.	5 pcs	1:5
32.	Wire Stripper	Adjustable stripper for Ethernet cables, supporting Cat5e, Cat6, and Cat6a.	5 pcs	1:5
33.	Label Printer	Portable printer.	2 pcs	1:13
34.	Multimeter	Digital multimeter capable of testing voltage, current, and continuity of network power supplies.	10 pcs	1:3
35.	Fiber Optic Splicing Kit	Includes fusion splicer, cleaver, and cleaning tools for fiber optic cable preparation and installation.	2 pcs	1:13