



REPUBLIC OF KENYA

COMPETENCY BASED MODULAR CURRICULUM

FOR

COMPUTER SCIENCE

KNQF LEVEL 6

(CYCLE 3)

PROGRAMME ISCED CODE: 0613 554 A.



TVET CDACC
P.O. BOX 15745-00100
NAIROBI

NETWORKING AND DISTRIBUTED SYSTEMS

ISCED UNIT CODE: 0613 554 03A

UNIT CODE:ICT/CU/CS/CR/07/6/MA

Relationship to Occupational Standards

This unit addresses the unit of competency: Create networks and Distributed Systems

Duration of Unit: 220 hours

Unit description:

This unit specifies the competencies required to understanding networking and distributed systems concept. It involves understanding networking and distributed systems, distributed system architectures, distributed processing and file management, setting up a network in a distributed environment understanding data communication standards and IP addressing and troubleshooting a network.

Summary of Learning Outcomes

Learning Outcomes	Durations (Hours)
1. Networking and distributed systems concepts	25
2. Distributed systems architectures	30
3. Distributed processing and file management	30
4. Network in a distributed environment	55
5. Data Communication Standards and IP addressing	30
6. Network troubleshoot	50
TOTAL	220

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Networking and distributed systems	1.1 Fundamentals of networking 1.1.1 Definition of network 1.1.2 Definition of network terminologies 1.1.3 Identified network components 1.1.4 Application and benefits of networking 1.2 Types of networks 1.2.1 LAN 1.2.2 MAN 1.2.3 WAN 1.2.4 PAN 1.3 Network topologies 1.3.1 Star 1.3.2 Ring 1.3.3 Mesh 1.3.4 Bus 1.4 Transmission media 1.4.1 Wired media 1.4.2 Wireless media 1.5 Distributed system 1.5.1 Definition 1.5.2 Application 1.6 Types of distributed systems 1.6.1 Computing 1.6.2 Information 1.6.3 Pervasive 1.6.4 Client server 1.6.5 Peer to peer	<ul style="list-style-type: none"> • Written tests • Observation • Oral tests • Practical tests

	<p>1.7 Distributed systems models</p> <p>1.7.1 Architectural</p> <p>1.7.2 Interaction</p> <p>1.7.3 Fault</p> <p>1.8 Specifying network requirements for a site</p> <p>1.8.1 Type of network</p> <p>1.8.2 Type of topology</p> <p>1.8.3 Devices</p> <p>1.9 Network security</p> <p>1.9.1 Definition</p> <p>1.9.2 Types of network attacks</p> <p>1.9.2.1 Active</p> <p>1.9.2.2 Passive</p> <p>1.10 Components of network security</p> <p>1.10.1 Network access control</p> <p>1.10.2 Firewall</p> <p>1.10.3 Intrusion prevention</p> <p>1.10.4 Security information and event management</p> <p>1.11 Wireless security</p>	
2 Distributed systems architectures	<p>2.1 Distributed architecture</p> <p>2.1.1 Definition</p> <p>2.1.2 Application</p> <p>2.2 Architecture styles</p> <p>2.2.1 Layered Architecture</p> <p>2.2.2 Object Based Architecture</p> <p>2.2.3 Data-centred Architecture</p> <p>2.3 Types of distributed system architectures</p> <p>2.3.1 Centralized</p> <p>2.3.2 Decentralized</p>	<ul style="list-style-type: none"> • Written tests • Observation • Oral tests • Practical tests

	<p>2.3.3 Hybrid</p> <p>2.4 Specifying distributed system architecture requirements for a simulated site</p> <p>2.4.1 Architecture style</p> <p>2.4.2 Type of distributed system architectures</p>	
3 Distributed processing and file management	<p>3.1 Types of distributed processing</p> <p>3.1.1 Distributed processing</p> <p>3.1.2 Parallel processing</p> <p>3.2 Types of file systems</p> <p>3.3 File sharing and accessing methods</p> <p>3.3.1 Remote access</p> <p>3.3.2 Data caching</p> <p>3.4 Distributed file sharing and access</p>	<ul style="list-style-type: none"> • Written tests • Observation • Oral tests • Practical tests
4 Network Set up in a distributed environment	<p>4.1 Tools, materials and devices</p> <p>4.2 Connection and configuration of network devices</p> <p>4.3 Installation and configuration of network software</p> <p>4.4 Testing the network</p>	<ul style="list-style-type: none"> • Written tests • Observation • Oral tests • Practical tests
5 Data Communication standards and IP addressing	<p>5.1 OSI model</p> <p>5.1.1 Definition</p> <p>5.1.2 Functions of different OSI model layers</p> <p>5.1.3 OSI layer Protocols are illustrated</p> <p>5.2 Data communication components</p> <p>5.2.1 Message</p> <p>5.2.2 Sender</p> <p>5.2.3 Receiver</p>	

	5.2.4 Medium 5.2.5 Protocol 5.3 Network IP Address classes 5.3.1 Class A, B, C 5.3.2 Public and Private IP Address 5.3.3 Automatic Private IP Address	
6 Network Troubleshooting	6.1 Troubleshooting techniques 6.1.1 Definition 6.1.2 Techniques 6.1.3 Procedures 6.2 Troubleshooting tools 6.2.1 Ping 6.2.2 Tracert/traceroute 6.2.3 Nslookup 6.2.4 Netstat 6.2.5 Pathping/mtr	<ul style="list-style-type: none"> • Written tests • Observation • Oral tests • Practical tests

Suggested Methods of Instruction

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised activities and projects in a site;
- Visiting lecturer/trainer from the ICT sector;
- Industrial visits.

Recommended Resources for 25 trainees

S/No.	Category/Item	Description/Specifications	Quantity	Recommended Ratio (Trainee: Item)

1	Learning Materials	Networking and Distributed Systems textbooks or manuals	25 copies	1:1
2		OSI Model diagrams, IP classes charts, and network topology charts	25 sets	1:1
3		Printed lab exercises and simulations	25 sets	1:1
4		Practical guides for configuring routers, switches, and distributed file systems	25 sets	1:1
5	Learning Facilities	Networked computer lab room with furniture, ventilation, power sockets	1 lab	Shared
6		Whiteboard/Smartboard or Projector + Screen	1	1 per class
7		Instructor station with demo setup and internet access	1	1:1
8	Infrastructure	Reliable electricity + Backup (UPS or Generator)	1 setup	Shared
9		Local Area Network (LAN) setup with internet access	1 setup	Shared
10		Internet access and router with DHCP and static IP configuration capability	1 setup	Shared
11	Tools & Equipment	Computers with NICs (Ethernet, Windows/Linux)	25	1:1
12		Network cables (CAT6 or CAT5e)	30+	1 per PC + extras
13		Ethernet switches (8/16/24 port unmanaged or managed)	2–3	8–12 trainees per switch
14		Wireless routers (for Wi-Fi and access point configuration)	2	12–15:1

15		Patch panels and cable testers	1–2	Shared
16		Crimping tools + RJ45 connectors	5 sets	5:1
17		PCs/laptops with virtualization software (VMware/VirtualBox) for distributed systems	25	1:1
18		Pre-installed network simulation software (e.g., Cisco Packet Tracer, GNS3)	25 installations	1:1
19		Operating system ISOs (Windows Server, Ubuntu, etc.)	25 copies	1:1
20		IP address planning sheets and subnetting charts	25	1:1
21	Consumable Materials	RJ45 connectors, electrical tape, velcro straps	As needed	Shared
22		Writing pads, pens, markers	25 sets	1:1
23		Printing paper and ink	As needed	Shared
24	Software & Security	Firewall and antivirus software for training labs	25 licenses	1:1
25		Packet sniffing tools (Wireshark)	25 installations	1:1
26		Network troubleshooting tools (Ping, Traceroute, Nslookup, Netstat, Pathping)	Preinstalled	1:1
27	Demonstration Kits	Router and switch demo kits	2–3	8–12:1
28		Distributed file system demonstration setup (e.g., shared folders, Samba, NFS)	Configured on lab machines	1:1
29		Network security demo tools (SIEM dashboard, simulated firewall, IDS/IPS)	1 virtual lab	Shared

30	Instructor Materials	Instructor's PC/laptop, preloaded with network scenarios and simulations	1	1:1
31		Lesson plans, assessment sheets, observation checklists	1 set	1:1