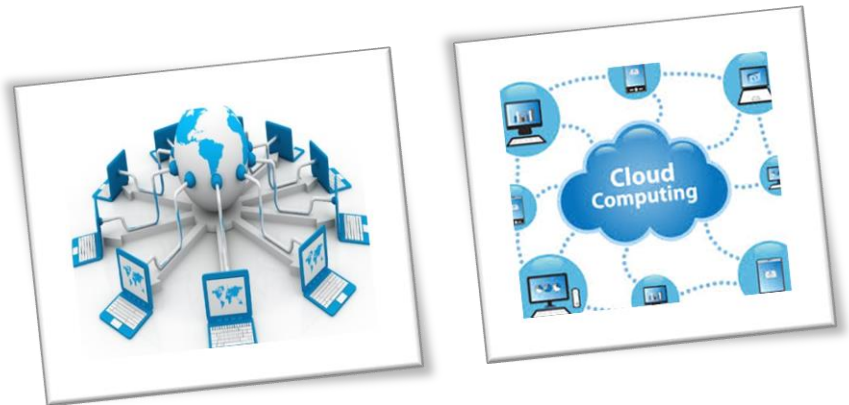


CURRICULUM OF “COMPUTER NETWORKING AND CLOUD COMPUTING”

“CLOUD CONFIGURATION ASSISTANT”
Level-4



Jan 2021



**National Vocational & Technical
Training Commission**

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Introduction

Definition/ Description of the training programme for Computer Networking and Cloud Computing “Cloud Configuration Assistant”

In large companies, computers in the workplace need to be connected to a single unit to get work done. Whether it's a company or some other shared hub, computers need to be able to share resources to accomplish goals and Cloud Computing provides huge computation and storage resources on demand and exciting most of individuals and businesses. Large user-base is attracted to use cloud computing mainly due to pay-per-usage and on-demand resource provisioning characteristics.

Purpose of the training programme

The Computer Networking and Cloud Computing programme is to engage young people with a programme of development that will provide them with the knowledge, skills and understanding to start this career in Pakistan. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of the trainees
- Provide opportunities for recognition of skills attained through non-formal or informal pathways
- Improve the quality and effectiveness of training and assessment for Computer Networking and Cloud Computing industry

Overall objectives of training programme

The overall objectives of the Computer Networking and Cloud Computing program are producing skilled staff to:

- Network Administrator
- Network Assistant
- Network Technicians
- Cloud Configuration Assistant
- Cloud System Administrator

Competencies to be gained after completion of course

1. Install Server Operating System
2. Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)
3. Configure Basic Wireless Network
4. Perform Window Based Network Administration
5. Perform LINUX Based Network Administration

6. Manage Video Conference and Meeting
7. Install configure CCTV and NVR
8. Perform NAS Configuration
9. Develop Programs Using Object Oriented Concepts
10. Perform Deployment of Cloud Application
11. Develop Application on any High-Level Programming Language
12. Perform Debugging of Cloud Application
13. Develop API Function
14. Build Application by Using Command Line Interface (CLI) and Software Development Kits (SDK)
15. Create Virtual Machines/Hypervisor in Data centre
16. Manage Virtual Machines/Hypervisor
17. Perform Basic Green Skills

Trainee entry level

The entry requirement for level-4 qualification would be level 3 in Computer Networking and Computing

Minimum qualification of trainer

Teaching staff qualification should be BS (EE) with specialization in computer, BS (Computer Engineering, Computer Science, Software Engineering, I.T, Computer Networks, Cyber security, Data Science, and IOT) or equivalent.

Recommended trainer: trainee ratio

The recommended maximum trainer: trainee ratio for this programme is 1 trainer for 25 trainees.

Medium of instruction i.e., language of instruction

Instruction will be Urdu and English.

Duration of the course (Total time, Theory & Practical time)

This curriculum comprises 17 modules. The recommended delivery time is 1200 hours. Delivery of the course could therefore be full time, 5 days a week, for 12 months. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follow:

Module Level-4	Theory ¹ Days/hours	Workplace ² Days/hours	Total hours	Credit hours
1. Install Server Operating System	16	33	49	4.9
2. Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)	12	48	60	6
3. Configure Basic Wireless Network	16	33	49	4.9
4. Perform Window Based Network Administration	12	48	60	6
5. Perform LINUX Based Network Administration	20	84	104	10.4
6. Manage Video Conference and Meeting	15	33	48	4.8
7. Install configure CCTV and NVR	15	33	48	4.8
8. Perform NAS Configuration	15	33	48	4.8
9. Develop Programs Using Object Oriented Concepts	14	93	107	10.7
10. Perform Deployment of Cloud Application	14	63	77	7.7
11. Develop Application on any High-Level Programming Language	11	93	104	10.4
12. Perform Debugging of Cloud Application	30	60	90	9

¹ Learning Module hours in training provider premises

² Training workshop, laboratory and on-the-job workplace

13. Develop API Function	16	63	79	7.9
14. Build Application by Using Command Line Interface (CLI) and Software Development Kits (SDK)	11	93	104	10.4
15. Create Virtual Machines/Hypervisor in Data centre	15	65	80	8
16. Manage Virtual Machines/Hypervisor	12	51	63	6.3
17. Perform Basic Green Skills	10	20	30	3

Sequence of the modules

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the industrial needs of Pakistan.

The distribution table is shown below:

Level-4

Module 1: Install Server Operating System Hours 49	Module 7: Install configure CCTV and NVR Hours 48	Module 13: Develop API Function Hours 79
Module 2: Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS) Hours 60	Module 8: Perform NAS Configuration Hours 48	Module 14: Build Application by Using Command Line Interface (CLI) and Software Development Kits (SDK) Hours 104
Module 3: Configure Basic Wireless Network Hours 49	Module 9: Develop Programs Using Object Oriented Concepts Hours 107	
Module 4: Perform Window Based Network Administration Hours 60	Module 10: Perform Deployment of Cloud Application Hours 77	Module 15: Create Virtual Machines/Hypervisor in Data centre Hours 80
Module 5: Perform LINUX Based Network Administration Hours 104	Module 11: Develop Application on any High-Level Programming Language Hours 104	Module 16: Manage Virtual Machines/Hypervisor Hours 63
Module 6: Manage Video Conference and Meeting Hours 48	Module 12: Perform Debugging of Cloud Application Hours 90	Module 17: Perform Basic Green Skills Hours 30

Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: Install server operating system Aim: The aim of this module to develop advanced knowledge, skills and understanding to Install server operating system	LU1. Perform server installation LU2. Perform windows installation LU3. Perform maintenance & troubleshooting	16	33	49
Module 2: Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS) Aim: The aim of this module to develop advanced knowledge, skills and understanding to Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)	LU1. Install network switch & PC's LU2. Configure VLANs LU3. Perform Inter-VLAN Routing by MLS LU4. Perform Troubleshooting	12	48	60
Module 4: Configure Basic Wireless Network Aim: The aim of this module to develop advanced knowledge, skills and understanding to Configure Basic Wireless Network	LU1. Log in and Configure Basic Wireless Settings LU2. Connect a Wireless Client	16	33	49

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 4: Perform Window Based Network Administration Aim: The aim of this module to develop advanced knowledge, skills and understanding to Perform Window Based Network Administration	LU1. Configure Active directory LU2. Configure DHCP Server LU3. Configure DNS Server LU4. Configure IIS Server LU5. Perform Troubleshooting of Window Based Network Administration	12	48	60
Module 5: Perform LINUX Based Network Administration Aim: The aim of this module to develop advanced knowledge, skills and understanding to Perform LINUX Based Network Administration	LU1. Configure DHCP Server LU2. Configure DNS Server LU3. Configure Web Server LU4. Perform Troubleshooting of DHCP Server LU5. Perform Troubleshooting of DNS Server LU6. Perform Troubleshooting of Apache Server	20	84	104
Module 6: Manage Video Conference and meeting Aim: The aim of this module to develop advanced knowledge, skills and understanding to Manage Video Conference and meeting	LU1. Install and Configure Video conference application LU2. Share space with participants	15	33	48

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 7: Configure CCTV and NVR Aim: The aim of this module to develop advanced knowledge, skills and understanding to Configure CCTV and NVR	LU1. Install cameras & NVR LU2. Perform the configuration of cameras & NVR LU3. Perform maintenance & troubleshooting LU4. Conduct Test	15	33	48
Module 8: Perform NAS configuration Aim: The aim of this module to develop advanced knowledge, skills and understanding to Perform NAS configuration	LU1. Perform NAS configuration LU2. Configure Storage Systems	15	33	48
Module 9: Develop Program using Object Oriented Concepts Aim: The aim of this module to develop advanced knowledge, skills and understanding to develop program using object-oriented concepts	LU1. Develop a program using built-in libraries LU2. Develop programs using classes LU3. Develop programs using encapsulation LU4. Develop program using classes with inheritance LU5. Develop program using classes with polymorphism LU6. Develop program using files	14	93	107

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 10: Perform deployment of cloud application Aim: The aim of this module to develop advanced knowledge, skills and understanding to perform deployment of cloud application	LU1. Collect Requirement for Cloud Computing Platform LU2. Create and Configure application. LU3. Configure application environment LU4. Access uploaded application	14	63	77
Module 11: Develop Application on any High-Level Programming Language Aim: The aim of this module to develop advanced knowledge, skills and understanding to develop application on any high-level programming language	LU1. Configure hosting plan LU2. Develop Static Web App LU3. Develop Dynamic Web App. LU4. Deploy application	11	93	104
Module 12: Perform Debugging of Cloud Application Aim: The aim of this module to develop advanced knowledge, skills and understanding to perform debugging of cloud application	LU1. Monitor Performance LU2. Perform monitoring with stack traces LU3. Use built-in cloud functions	30	60	90

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 13: Develop API Functions Aim: The aim of this module to develop advanced knowledge, skills and understanding to develop API functions	LU1. Design the API LU2. Perform Virtualization on API's LU3. Build API's business logic	16	63	79
Module 14: Build application by using Command Line Interface (CLI) and Software Development Kits (SDK) Aim: The aim of this module to develop advanced knowledge, skills and understanding to build application by using command line interface (CLI) and software development Kits (SDK)	LU1. Perform Virtual Environment (Virtualenv) functionality LU2. Request library through python LU3. Manage vulnerabilities	11	93	104
Module 15: Create virtual machines/hypervisor in a datacenter Aim: The aim of this module to develop advanced knowledge, skills and understanding to Create virtual machines/hypervisor in a datacenter	LU1. Create virtual machine LU2. Manage networking of Virtual Machine	15	65	80

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 16: Manage Virtual Machine/Hypervisor Aim: The aim of this module to develop advanced knowledge, skills and understanding to Manage Virtual Machine/Hypervisor	LU1. Modify the Virtual Machines LU2. Create Virtual Machine Snapshots LU3. Perform Resource Management and Monitoring LU4. Troubleshoot the network connectivity LU5. Troubleshoot the allocated resources	12	51	63
Module 17: Perform Basic Green Skills Aim: The aim of this module to develop advanced knowledge, skills and understanding to Perform basic green skills	LU1. Manage sustainability of materials LU2. Manage waste	10	20	30

Modules

LEVEL 4

Module 1: Install Server Operating System

Objective: This competency unit covers the skills and required knowledge to install and configure computer operating systems (windows, Linux etc), hardware and networks. The underpinning knowledge regarding computer operating systems, hardware and networks will be suffice

Duration: 49 Hours

Theory: 16 Hours

Practice: 33 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform server installation	Trainee will be able to: <ol style="list-style-type: none"> 1. Configure YAML file. 2. Create web server gateway interface (WSGI) application. 3. Write Scripts according to application requirements. 4. Perform a Sanity check. 	<ul style="list-style-type: none"> • Knowledge of YAML file • Knowledge of server machine • Understanding of scripts • Understanding of sanity check • Explain gateway interface • Explain Flask server • Raid types <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to Install windows server OS 	Total- 15 Hrs. Theory- 6 Hrs. Practice- 9 Hrs.	Computer /Server Key board Mouse Power cables VGA Cables LCD Screen	Computer Lab
LU2. Develop Dynamic Web	Trainee will be able to: <ol style="list-style-type: none"> 1. Check the compatibility of 	<ul style="list-style-type: none"> • Understanding of single-user and multi-user operating systems Offsets and their 	Total- 17 Hrs.	DVD drive Super VGA (800 x	Computer Lab

App	<p>hardware according to requirement</p> <p>2. Install the operating system on workstation as required</p>	<p>types.</p> <ul style="list-style-type: none"> History of Filesystem File system of windows vs Linux sheet. <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Practice to Install client on (windows) on desktop or VMware 	<p>Theory- 5 Hrs.</p> <p>Practice- 12 Hrs.</p>	<p>600) or higher-resolution monitor</p> <p>Keyboard Internet access</p>	
LU3. Perform maintenance & troubleshooting	<p>Trainee will be able to:</p> <p>1. Identify system error and rectify</p> <p>2. Create backup and recovery</p> <p>3. Re-install the server operating system</p>	<ul style="list-style-type: none"> Knowledge of <ul style="list-style-type: none"> Raid Raid Types BIOS SAS SATA SSD <p><u>Practical Activity</u></p> <p>Practice to create backup of entire operating system using windows utility</p>	<p>Total- 17 Hrs.</p> <p>Theory- 5 Hrs.</p> <p>Practice- 12 Hrs.</p>	<p>Desktop/Server</p> <p>Key board</p> <p>Mouse</p> <p>Power cables</p> <p>VGA Cables</p> <p>LCD Screen</p>	Computer Lab

Module 2: Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)

Objective: This unit describes the skills and knowledge required to manage different departments in Local area Network, and how to forward traffic from one VLAN to another VLAN by using MLS

Duration: 60 Hours

Theory: 12 Hours

Practice: 48 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install network switch & PC's	Trainee will be able to: <ol style="list-style-type: none"> 1. Perform console connection to the switch 2. Connect PC's or devices to Switch with Ethernet cables 3. Configure a Trunk Link between switches 4. Assign IP addresses to PC's 	<ul style="list-style-type: none"> • Basic knowledge of Switch • Knowledge about International available manufacturer's switches • Understanding of different External ports of Router (LAN, WAN & Admin Ports (Console, AUX)) <p><u>Practical Activity</u> Connect the switch using HyperTerminal and show the output on screen</p>	Total- 13 Hrs Theory- 4 Hrs. Practice- 9 Hrs.	Desktop/Server Key board Mouse Power cables VGA Cables LCD Screen Router Router IOS	Computer Lab
LU2. Configure VLANS	Trainee will be able to: <ol style="list-style-type: none"> 1. Configure two VLAN's 10 & 20 with name as IT & Accounts respectively 2. Assign the ports to specific VLAN 3. Ping from IT department (VLAN 10) to Accounts department (VLAN 20) 	<ul style="list-style-type: none"> • Understanding of IEEE 802.1Q Standard • Basic knowledge of simulator/switch configuration • IOS components • IPv4 & IPv6 addressing Scheme & Subnetting • IOS Commands for VLAN 	Total- 15 Hrs Theory- 3 Hrs	DVD drive Super VGA (800 x 600) or higher-resolution monitor Keyboard Internet access 24 port switch (3)	Computer Lab

		<p>configurations</p> <p><u>Practical Activity</u></p> <p>Configure two VLANS 10 & 20 as IT& Accounts and do pining between these VLANs using any Simulator</p>	Practice- 12 Hrs.		
<p>LU3. Perform Inter-VLAN Routing by MLS</p>	<p>Trainee will be able to:</p> <ol style="list-style-type: none"> 1. Configure two switch virtual interfaces (SVI) 2. Assign IP addresses 3. Communicate within the department 	<ul style="list-style-type: none"> • Knowledge about Inter VLAN routing • Knowledge of switch virtual interfaces, its usage & benefits • Knowledge of Ethernet Frame Tagging • Understanding of Spits working & flavors (RSTP, MSTP) • Understanding of link types (Access, Trunk& Hybrid mode) <p><u>Practical Activity</u></p> <p>Practice to create 3 VLANS perform inter VLAN routing using packet tracer</p>	<p>Total- 15 Hrs.</p> <p>Theory- 3 Hrs.</p> <p>Practice- 12 Hrs.</p>	<p>Desktop/Server</p> <p>Key board</p> <p>Mouse</p> <p>Power cables</p> <p>Ethernet cables/ Serial Cables</p> <p>VGA Cables</p> <p>Console cable</p> <p>LCD Screen</p> <p>GNS3 simulator</p> <p>Packet Tracer</p> <p>24 port layer2 switch</p> <p>24 port layer 3 switch</p>	<p>Computer Lab</p> <p>GNS3</p> <p>Packet Tracer</p>
<p>LU4. Perform Troubleshoot ing</p>	<p>Trainee will be able to:</p> <ol style="list-style-type: none"> 1. Troubleshoot the trunk link and status of ports 2. Troubleshoot the VLAN, SVI's & their IP addresses 3. Secure LAN from Internal & External attacks 	<ul style="list-style-type: none"> • Understanding of Port fast, Port Mirroring, Port Forwarding & Port-Security • Understanding of EtherChannel/Port channel/Link Aggregation Group • Trouble shooting commands for 	<p>Total- 17 Hrs.</p> <p>Theory- 2 Hrs.</p>	<p>Desktop/Server</p> <p>Key board</p> <p>Mouse</p> <p>Power cables</p> <p>Ethernet cables/ Serial Cables</p>	<p>Computer Lab</p> <p>GNS3</p> <p>Packet Tracer</p>

		switch <u>Practical Activity</u> Practice to troubleshoot the VLANs using commands	Practice- 15 Hrs.	VGA Cables LCD Screen GNS3 simulator Packet Tracer 24 port layer2 switch 24 port layer 3 switch	
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Module 3: Configure Basic Wireless Network

Objective: This unit describes the skills and knowledge required to learn the extension of wired local area network and how to setup Wireless Local Area Network (WLAN) for wireless Clients/Station.

Duration: 49Hours

Theory: 16 Hours

Practice: 33 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Login and configure wireless settings	Trainee will be able to: <ol style="list-style-type: none"> 1. Connect the computer to the router 2. Login using default username / password 3. Configure SSID for your wireless network 4. Configure wireless security 5. Clean the threat /malware using antivirus tool 6. Configure DHCP settings. 7. Change the default administrative password 	<ul style="list-style-type: none"> • Knowledge about International available manufacturer's WIFI APs • Understanding of different External ports of APs • knowledge of service set identifier (SSID) • Understanding of 802.11a or 802.11b/g • Understanding of IEEE 802.1Q Standard • SSID security • Basic of DHCP <u>Practical Activity</u> <ul style="list-style-type: none"> • Practice to access the web interface of AP using default IPs • Practice to configure the DCHP IP pools on AP 	Total- 27 Hrs. Theory- 9 Hrs. Practice- 18 Hrs.	Computer system Router Router IOS Access point	Computer Lab
LU2. Connect a Wireless Client	Trainee will be able to: <ol style="list-style-type: none"> 1. Select the configured SSID 	<ul style="list-style-type: none"> • Knowledge of Wi-Fi Protected Access (WPA) <u>Practical Activity</u>	Total- 22 Hrs.	Computer system Router	Computer Lab Access point

	2. Enter the password 3. Test the connectivity with Wi-Fi router/AP.	Practice to connect the mobile or desktop with Wi-Fi router	Theory- 7 Hrs. Practice- 15 Hrs.	Router IOS Access point	
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Module 4: Perform Window Based Network Administration

Objective: This unit describes the skills and knowledge required to configure, manage & maintain the DHCP & DNS server on Enterprise Network.

Duration: 60 Hours

Theory: 12 Hours

Practice: 48 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Configure Active directory	Trainee will be able to: <ol style="list-style-type: none"> 1. Login to the Server 2. Install the required software for active directory services 3. Configure the Active Directory 4. Test the Active Directory 	<ul style="list-style-type: none"> • Knowledge about <ul style="list-style-type: none"> ○ Active directory, ○ AD Database, • Logical Structure: Trees, Forest, Domains and OU <p><u>Practical Activity</u></p> <p>Practice to configure local domain using DC promo command and add client</p>	Total- 12 Hrs. Theory- 3 Hrs. Practice- 9 Hrs.	Desktop/Server Key board Mouse Power cables VGA Cables LCD Screen Windows Server OS	Computer Lab
LU2. Configure DHCP Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Install the required software DHCP Server 2. Configure the DHCP Server 3. Test the DHCP server with client 	<ul style="list-style-type: none"> • Understanding of IEEE 802.1Q Standard • SSID security • Basic of DHCP <p><u>Practical Activity</u></p> <p>Practice to configure DHCP server</p>	Total- 12 Hrs. Theory- 3 Hrs. Practice-	DVD drive Super VGA (800 x 600) or higher-resolution monitor Keyboard Internet access	Computer Lab

		and assign IP to client	9 Hrs.	Access point	
LU3. Configure DNS Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Install the required software DNS Server 2. Configure the DNS Server 3. Test the DNS server with client 	<ul style="list-style-type: none"> • Knowledge of Wi-Fi Protected Access (WPA) <u>Practical Activity</u> Practice to configure DNS server and resolve the names of client	Total- 12 Hrs. Theory- 3 Hrs. Practice- 9 Hrs.	Desktop/Server Key board Mouse Power cables Ethernet cables/ Serial Cables VGA Cables LCD Screen Windows Server OS 2019/2016 etc.	Computer Lab Access point
LU4. Configure IIS Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Install the required software IIS Server 2. Configure the IIS Server as per instructed 3. Test the IIS server with client 	<ul style="list-style-type: none"> • Understanding of ICMP packet • Basic if Ip commands <u>Practical Activity</u> Practice to configure IIS server and host simple file on that server	Total- 12 Hrs. Theory- 3 Hrs. Practice- 9 Hrs.	Desktop/Server Key board Mouse Power cables Ethernet cables/ VGA Cables LCD Screen GNS3 simulator Packet Tracer Windows Server	Computer Lab Access point

LU5. Perform troubleshooting of Window Based Network Administration	Trainee will be able to: <ol style="list-style-type: none"> 1. Identify the problem in Server 2. Check the log files 3. Use the command lines tool for investigation 4. Go to graphical interface of webserver for fixing the issue 5. Apply the necessary command lines/graphical tools for fixing the issue 6. Conduct the test to check server and client 	<ul style="list-style-type: none"> • Understanding of ICMP packet • Knowledge FSMO roles • AD Database, • Logical Structure: Trees, Forest, Domains and OU • Understanding of IEEE 802.1Q Standard • SSID security • Knowledge of DHCP • Knowledge of DNS log files • Basic knowledge of troubleshooting commands of DNS • Knowledge of DNS server <p><u>Practical Activity</u></p> <p>Practice to rectify issues in DHCP sever</p>	Total- 15 Hrs. Theory- 3 Hrs. Practice- 12 Hrs.	Desktop/Server Power cables Client PC Internet	Computer Lab Access point
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Module 5: Perform LINUX Based Network Administration

Objective: This module covers the skills and required knowledge to install and configure computer operating systems Linux. Linux networking topics include installing and supporting SSH, DNS, SHCP and the Apache Web server. Common security issues are discussed, configure and upgrade Linux systems running one of the three major Linux distribution families: Red Hat, SUSE, Debian/Ubuntu to provide the basis for the job at workplace

Duration: 104 Hours

Theory: 20 Hours

Practice: 84 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Configure DHCP Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Install the required software DHCP Server 2. Configure the DHCP Server options as per instructed. 3. Test the DHCP server with client 	<ul style="list-style-type: none"> • Knowledge of Linux operating system • Knowledge Linux DHCP configuration files <p><u>Practical Activity</u></p> <p>Install and configure DHCP server on Ubuntu/CentOS</p>	Total- 16 Hrs Theory- 4 Hrs Practice- 12 Hrs	Desktop/Server Key board Mouse Power cables VGA Cables LCD Screen Linux OS	Computer Lab
LU2. Configure DNS Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Install the required software DNS Server 2. Configure the DNS Server 3. Test the DNS server with client 	<ul style="list-style-type: none"> • Basic Knowledge of bind software • Knowledge of DNS configuration files <p><u>Practical Activity</u></p> <p>Install bind and configure DNS server</p>	Total- 15 Hrs Theory- 3 Hrs Practice- 12 Hrs	DVD drive Super VGA (800 x 600) or higher-resolution monitor Keyboard Internet access Linux OS	Computer Lab

LU3. Configure Web Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Install the required software Web Server 2. Configure the Web Server as per instructed 3. Test the Web server with client 	<ul style="list-style-type: none"> • Knowledge of Linux web servers • Basic knowledge of http server files <p><u>Practical Activity</u></p> <p>Install httpd server on Linux and configure for simple webhosting</p>	Total- 18 Hrs Theory- 3 Hrs Practice- 15 Hrs	Desktop/Server Key board Mouse Power cables Ethernet cables/ Serial Cables VGA Cables LCD Screen Linux OS	Computer Lab
LU4. Perform Troubleshooting of DHCP Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Identify the problem in DHCP Server 2. Check the log files 3. Use the command lines tool for investigation as per instructed 4. Apply the necessary tools for fixing the issue 5. Conduct the test 	<ul style="list-style-type: none"> • Knowledge Linux DHCP actually works: • Knowledge of Log file <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Go to /var/log/ and check DHCP log files for issue 	Total- 18 Hrs Theory- 3 Hrs Practice- 15Hrs	Desktop/Server Key board Mouse Power cables VGA Cables LCD Screen Linux OS	Computer Lab
LU5. Perform Troubleshooting of DNS Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Identify the problem in DNS Server 	<ul style="list-style-type: none"> • Basic Knowledge of bind software • Knowledge of DNS configuration files 	Total- 18 Hrs Theory-	DVD drive Super VGA (800 x 600) or higher-resolution monitor	Computer Lab

	<ol style="list-style-type: none"> 2. Check the log files 3. Use the command lines tool for investigation as per instructed 4. Go to graphical interface of DNS for fixing the issue as per instructed 5. Apply the necessary command lines/graphical tools for fixing the issue 6. Conduct the test 	<u>Practical Activity</u> Go to /var/log/named directory and check the log files related to DNS issue	3 Hrs Practice- 15 Hrs	Keyboard Internet access Linux OS	
LU6. Perform Troubleshooting of Apache Server	Trainee will be able to: <ol style="list-style-type: none"> 1. Identify the problem in IIS Server 2. Check the log files 3. Use the command lines tool for investigation as per instructed 4. Go to graphical interface of webserver for fixing the issue as per instructed 5. Apply the necessary command lines/graphical tools for fixing the issue 6. Conduct the test 	<ul style="list-style-type: none"> • Knowledge of log files of Apache web server <u>Practical Activity</u> Go to /var/log directory and check the log files related to web server for identification of issues	Total- 18 Hrs Theory- 3 Hrs Practice- 15 Hrs	Desktop/Server Key board Mouse Power cables Ethernet cables/ Serial Cables VGA Cables LCD Screen Linux OS	Computer Lab

Module 6 Manage Video Conference and Meeting

Objective: This unit covers the skills and required knowledge to setup, install, invite and operate Video conference and meeting in various configuration applications.

Duration: 48 Hours

Theory: 15 Hours

Practice: 33 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install and Configure Video conference application	Trainee will be able to: <ol style="list-style-type: none"> 1. Install video conference apps on computer 2. Authorize user for video meeting/conference 3. Schedule meeting through Date and time on video application 4. Send invitation to users 5. Configure all setting and security before starting the meeting 	<ul style="list-style-type: none"> • knowledge of video conference applications <p><u>Practical Activity</u></p> <p>Practice to Install video conference applications</p>	Total- 29 Hrs Theory- 8 Hrs Practice- 21 Hrs	Desktop Conference Application	Computer Lab
LU2. Share space with participant	Trainee will be able to: <ol style="list-style-type: none"> 1. Create sharable document 2. Assign permission on document 	<ul style="list-style-type: none"> • knowledge of online document creation and collaboration <p><u>Practical Activity</u></p> <p>Practice to create online</p>	Total- 19 Hrs Theory- 7 Hrs Practice- 12 Hrs.	Desktop Video conference Applications	Computer Lab

	3. Share link with the participants	document using Google docs and shared with participant			
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Module 7 Install and Configure CCTV and NVR

Objective: This competency unit covers the skills and required knowledge to Installation of CCTV systems, whether analogue, digital or a combination of these technologies. The underpinning knowledge regarding CCTV systems and NVR's,

Duration: 48 Hours

Theory: 15 Hours

Practice: 33 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install cameras & NVR	Trainee will be able to: <ol style="list-style-type: none"> 1. Conduct survey of the site 2. Design solution and select equipment 3. Install the components for CCTV / IP camera system 4. Install display unit for monitoring 5. Install duct & mount servers in Rack 	<ul style="list-style-type: none"> • Knowledge of CCTV /IP Cameras • Knowledge of cabling and types • Understanding of ducting • Knowledge of rack and types of rack installation • Common problems (Hardware Related) with on-site server room • Understanding of sever room temperature stability <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to perform survey for installation of CCTV Practice to install server in rack 	Total- 17 Hrs Theory- 5 Hrs Practice- 12 Hrs	Desktop \ \ CCTV/IP Cameras NVR/DVR Storage device Cables Rack Devices Temperature maintain device	Computer Lab

LU2. Perform configuration of cameras & NVR	Trainee will be able to: <ol style="list-style-type: none"> 1. Connect NVR with LAN and internet 2. Connect DVR with CCTV camera and internet 3. Connect the IP cameras with NVR 4. Connect CCTV camera with DVR 5. Install desktop and mobile client to remotely access NVR and DVR 6. Configure firewall for the security of surveillance system 7. Configure storage parameters for CCTV/IP camera and NVR 	<ul style="list-style-type: none"> • Basic knowledge of NVR vs DVR <u>Practical Activity</u> <ul style="list-style-type: none"> • Practice to install CCTV camera in lab and connect with DVR 	Total- 13 Hrs Theory- 4 Hrs Practice- 9 Hrs	Desktop CCTV/IP Cameras NVR/DVR Storage device	Computer Lab
LU3. Perform maintenance & troubleshooting	Trainee will be able to: <ol style="list-style-type: none"> 1. Rectify CCTV/IP Cameras connectivity with NVR, DVR & display units 2. Check communication protocols between IP cameras and NVRS 3. Inspect cable health 	<ul style="list-style-type: none"> • knowledge of troubleshooting concepts of IP/CCTV cameras <u>Practical Activity</u> Practice to test the connectivity between NVR and IP cameras	Total- 9 Hrs Theory- 3 Hrs Practice- 6 Hrs	Desktop CCTV/IP Cameras NVR/DVR Storage device	Computer Lab
LU4. Conduct	Trainee will be able to:	<ul style="list-style-type: none"> • knowledge of internet connectivity of NVR/DVR 	Total-	Desktop	

Test	<ol style="list-style-type: none"> 1. Check accessibility over internet 2. Check the display unit to work properly 3. Check the data backup of CCTV/IP cameras 	<p>over the internet</p> <p><u>Practical Activity</u></p> <p>Practice to check recorded data</p>	<p>9 Hrs</p> <p>Theory-</p> <p>3 Hrs</p> <p>Practice-</p> <p>6 Hrs</p>	<p>CCTV/IP Cameras</p> <p>NVR/DVR</p> <p>Storage device</p>	
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Module 8 Perform NAS Configuration

Objective: This competency unit covers the skills and required knowledge to perform NAS configuration.

Duration: 48 Hours

Theory: 15Hours

Practice: 33Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform NAS configuration	Trainee will be able to: <ol style="list-style-type: none"> 1. Identify hardware requirements and specifications for storage 2. Configure IP addressing 3. Configure the components to ensure the connectivity 	<ul style="list-style-type: none"> • Knowledge of hardware and software requirements for NAS • Knowledge of IP addressing • understanding of network configuration <p>Practical Activity</p> <ul style="list-style-type: none"> • practice to configure IP addresses on any devices to check connectivity successfully 	Total- 23 Hrs Theory- 8 Hrs Practice- 15 Hrs	Computer System High speed internet Storage device Router/ Switch	Class Room/ Lab
LU2. Configure Storage Systems	Trainee will be able to: <ol style="list-style-type: none"> 1. Configure the shared storage 2. Configure the user accounts 3. Configure the permissions for the storage 4. Configure storage as a local drive 	<ul style="list-style-type: none"> • Knowledge of shared storage • Knowledge of NAS and its working • Uses of NAS as local drive • Convert external hard drive to NAS <p>Practical Activity</p> <ul style="list-style-type: none"> • practice to configure the shared storage • Perform practical task to configure 	Total- 25 Hrs Theory- 7 Hrs Practice- 18 Hrs	Computer System High speed internet Storage device Router/ Switch	Class Room/ Lab

		<p>the user accounts and permission for storage</p> <ul style="list-style-type: none"> • Practice to configure NAS as a local drive 			
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Module 9 Develop Programs using Object Oriented Concepts

Objective of the module: This unit describes the skills and knowledge required to learn troubleshooting of network connectivity, allocated resources and operating system issues.

Duration: 107 hours **Theory:** 14 hours **Practical:** 93 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Develop a program using built-in libraries	The trainee will be able to: <ol style="list-style-type: none"> 1. Open IDE for coding 2. Create basic program structure 3. Import the header file 4. Call the functions instructed by task from the built-in library. 5. Perform the task 6. Debug the code in case of error 7. Run the code to display the correct answer 	<ul style="list-style-type: none"> Libraries and its advantages Explain the header file Knowledge of program that is using built in library and using its function <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Practice to develop application to calculate math library 	Total- 15 Hrs Theory- 3 Hrs Practice- 12 Hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners <p>Non</p> <ul style="list-style-type: none"> Computer system IDE 	Computer Lab
LU2: Develop programs using classes	The trainee will be able to: <ol style="list-style-type: none"> 1. Open IDE for coding 2. Create basic program structure and create simple class 3. Declare member functions and variables of the class 4. Create the objects of that class 5. Initialize the object 	<ul style="list-style-type: none"> Describe Classes and its benefits Explain member method and attributes or member variables Explain how to declare a class and its member methods and member variables 	Total- 15 Hrs Theory- 3 Hrs Practice- 12 Hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners <p>Non</p>	Computer Lab

	6. Access the functions and data of particular objects. 7. Debug the code in case of error 8. Run the code to display the correct answer	<ul style="list-style-type: none"> Implement class Able to Compile and Execute the program <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Practice to create class for arithmetic operations Practice to create another class and make object of previous class 		<ul style="list-style-type: none"> Computer system IDE 	
LU3: Develop programs using encapsulation	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Open IDE for coding Create basic program structure and create simple class Initialize the function header, with parameters and return type Declare member functions and variables of the class Apply encapsulation (private, public) on the classes Create the objects of that class Initialize the object Access the functions and data of particular objects. Debug the code in case of error Run the code to display the correct answer 	<ul style="list-style-type: none"> encapsulation concepts (public , private, protected) Implement of classes on Concepts of Encapsulation Knowledge of getter and setter methods <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Practice to create a class for cylinder and create a function to calculate the volume of cylinder Create a class named as car with private data member named as speed. Make getter and setter for speed variable. Declare new class named as race. Declare 3 objects of car class and set 	Total- 17 Hrs Theory- 2 Hrs Practice- 15 Hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Non Computer system IDE 	Computer Lab

		each object speed using getter and setter methods			
LU4: Develop program using classes with inheritance	The trainee will be able to: <ol style="list-style-type: none"> 1. Open IDE for coding 2. Create basic program structure and create parent class required by the problem 3. Declare child class/classes 4. Declare member functions and variables of the classes 5. Create the objects of that both classes parent and child 6. Initialize the object 7. Access the functions and data of declared objects as per the requirement of the problem 8. Debug the code in case of error 9. Run the code to display the correct answer 	<ul style="list-style-type: none"> • Inheritance and its types • Explain Base class and Child class Concepts • Inheritance concept <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to Create parent class named as 'a' and create 'A' sub class 'B'. Which is extends from class 'A'. And use these classes in 'inherit' class 	Total- 20 Hrs Theory- 2 Hrs Practice- 18 Hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non</p> <ul style="list-style-type: none"> • Computer system IDE 	Computer Lab
LU5: Develop program using classes with polymorphism	The trainee will be able to: <ol style="list-style-type: none"> 1. Open IDE for coding 2. Create basic program structure and create parent class required by the problem 3. Declare child class/classes 	<ul style="list-style-type: none"> • Polymorphism and its concepts (overloading and overriding) • Implement overloading 	Total- 20 Hrs Theory- 2 Hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers 	, Computer Lab

	<ol style="list-style-type: none"> 4. Declare member functions and variables of the classes 5. Create the objects of that both classes parent and child 6. Initialize the object 7. Access the functions and data of declared objects to show polymorphic behaviour 8. Debug the code in case of error 9. Run the code to display the correct answer 	<ul style="list-style-type: none"> • Implement Overriding • Early binding and late binding <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to create parent class named as 'animal' and create two child classes named as cat and dog. <ul style="list-style-type: none"> ✓ Create member function named as speak in parent class. ✓ Create override functions named as speak both in child classes ✓ Create a fourth-class name as zoo and implement the concept of polymorphism 	Practice- 18 Hrs	<ul style="list-style-type: none"> • Sharpeners Non • Computer system IDE 	
LU6: Develop program using files	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Open IDE for coding 2. Create basic program structure 3. Write the code to open file from program 4. Declare member functions and variables of the classes 5. Write data in that file from the program. 6. Write code to open another file from program 7. Read data from that file and display it 	<ul style="list-style-type: none"> • File system and its benefits • Write program to create and open file • Write program to read file and display data • Write program to write file • Able to Compile and Execute the program • Verify the outputs 	Total- 20 Hrs Theory- 2 Hrs Practice- 18 Hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non • Computer system IDE 	Computer Lab

	<p>8. Debug the code in case of error</p> <p>9. Run the code to display the correct answer</p>	<p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to create a text file and insert some text data in created/direct file. • Practice to read a text file and display its contents. 			
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Module 10 Perform Deployment of Cloud Application

Objective: After this competency, standard candidate will be able to deploy a cloud application

Duration: 77 Hours

Theory: 14 Hours

Practice: 63 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Collect Requirement for Cloud Computing Platform	<ol style="list-style-type: none"> 1. Organize interview sessions for clients. 2. Gather information regarding VM's or virtualization. 3. Gather information regarding storage spaces. 4. Gather information regarding networking 5. Create prototype to help visualize processes 6. Get the requirements approved formally from client side 	<ul style="list-style-type: none"> • Understanding of SLA (Service Level Agreement) between user/clients, and SLA elements. • Knowledge about Customer and Service Provider /Service supplier. • Knowledge of different services (IaaS, PaaS, SaaS and XaaS) • Understanding of organizations developing cloud compliance standards (NIST, CSCC, DMTF, ETSI and ISO) • knowledge of frameworks (OpenStack, Nimbus, Eucalyptus, and Open Nebula) 	Total- 16 Hrs Theory- 7 Hrs Practice- 9 Hrs	<ul style="list-style-type: none"> • Computer system Internet Pen Not book	computer lab

		<ul style="list-style-type: none"> • Comparative study of SLA for different service providers • Study of different aspects of service provider (Gartner Peer Insights) • Understanding of Cloud Computing Models/services (On Premises, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), • Hypervisor and its type (Type 1 hypervisor and Type 2 Hypervisor) • Types of SLA (Service-based SLA, Multi-level SLA, etc.) • Types of cloud storage (Public Cloud, Private Cloud, Hybrid Cloud) • Understanding of different types of disks knowledge about VM disks, differences between centralized and distributed storage • principles of validation in cloud computing 			
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		<ul style="list-style-type: none"> • risk level of the application, <ul style="list-style-type: none"> ○ Security ○ Data Integrity, ○ Audit trails ○ Electronic Signatures • IT-as-provider • IT-as-broker • DevOps • Agile • prototype and prototype Generator • Understanding of factors to prioritize the requirements (cost, time, importance, risk etc. <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Conduct survey for installation of cloud for client • Practice to prepare SLA design and pricing different service providers 			
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LU2. Create and Configure application	Trainee will be able to: <ol style="list-style-type: none"> 1. Login to cloud server 2. Create a new application on cloud server 3. Configure application 	<ul style="list-style-type: none"> • Knowledge of cloud server <u>Practical Activity</u> Practice to login to cloud server and create space for application	Total- 23 Hrs Theory- 2 Hrs Practice- 21 Hrs	Desktop Cloud account Internet	Computer Lab
LU3. Configure application environment	Trainee will be able to: <ol style="list-style-type: none"> 1. Create web server environment as per requirement (single instance, load balancing or auto scaling environment) 2. Create worker environment 3. Build Environment type 4. Deploy application on cloud 5. Create environment inside a VPC 	<ul style="list-style-type: none"> • knowledge of cloud server • knowledge of VPC <u>Practical Activity</u> Practice to configure application on web cloud	Total- 21 Hrs Theory- 3 Hrs Practice- 18 Hrs	Desktop Cloud account Internet	Computer Lab
LU4. Access uploaded application	Trainee will be able to: <ol style="list-style-type: none"> 1. Extract URL from dashboard 2. Review upload application 	<ul style="list-style-type: none"> • Knowledge about Live IPs and URL <u>Practical Activity</u>	Total- 17 Hrs. Theory-	Desktop Cloud account Internet	Computer Lab

		<ul style="list-style-type: none"> Practice to access the URL on desktop 	2 Hrs. Practice- 15 Hrs.		
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Module 11 Develop Application on any High-Level Programming Language

Objective: After this competency, standard candidate will be able to develop application using any high-level programming language.

Duration: 104 Hours

Theory: 11 Hours

Practice: 93 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Configure hosting plan	Trainee will be able to: <ol style="list-style-type: none"> 1. Create a feasible hosting plan. 2. Configure Web servers with hosting plan. 3. Download Python SDK (Software Development kit) and another framework 4. Get request response for a webpage 	<ul style="list-style-type: none"> • knowledge of operating system • knowledge of SDK <u>Practical Activity</u> <ul style="list-style-type: none"> • Practice to create hosting Plan 	Total- 18 Hrs Theory- 3 Hrs Practice- 15 Hrs	Desktop Cloud account Internet	Computer Lab
LU2. Develop Static Web App	Trainee will be able to: <ol style="list-style-type: none"> 1. Configure YAML file. 2. Create web server gateway interface (WSGI) application. 3. Write Scripts according to application requirements. 4. Perform a Sanity check. 	<ul style="list-style-type: none"> • Knowledge of YAML, WSGI • Knowledge of Static and dynamic web pages <u>Practical Activity</u> <p>Practice to develop Static Web page</p>	Total- 30 Hrs Theory- 3 Hrs Practice- 27 Hrs	Desktop Cloud account Internet Python software	Computer Lab
LU3. Develop Dynamic Web	Trainee will be able to: <ol style="list-style-type: none"> 1. Upgrade web application to 	<ul style="list-style-type: none"> • Knowledge of Python • Knowledge of basic syntax of 	Total-	Desktop	Computer Lab

App	<p>use WSGI.</p> <ol style="list-style-type: none"> 2. Create code or scripts to retrieve information from users. 3. Protect application from malicious users, using python escape functions 4. Perform frequent sanity checks 	<p>Python language</p> <ul style="list-style-type: none"> • Knowledge of different Python frameworks • Knowledge of python functions and scripting <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to develop Dynamic Web app • Scripting practice 	<p>32 Hrs</p> <p>Theory- 2 Hrs</p> <p>Practice- 30 Hrs</p>	Cloud account Internet	
LU4. Deploy application	<p>Trainee will be able to:</p> <ol style="list-style-type: none"> 1. Navigate to available cloud platform 2. Upload the application on your Hosting platform. 3. Review uploaded application using URL 	<ul style="list-style-type: none"> • In depth knowledge of cloud APIs • Application uploading • Binding URLs <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Deploy application on cloud 	<p>Total- 23 Hrs</p> <p>Theory- 2 Hrs</p> <p>Practice- 21 Hrs</p>	Desktop Cloud account Internet	Computer Lab

Module 12 Perform Debugging of Cloud Application

Objective: After this competency, standard candidate will be able to debug live python codes and cloud applications

Duration: 90 Hours

Theory: 30Hours

Practice: 60 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Monitor Performance	Trainee will be able to: <ol style="list-style-type: none"> 1. Install Sentry 2. Monitor performance issues 3. Resolve errors and poor performing API calls 	<ul style="list-style-type: none"> • Knowledge about 30AWS Monitoring Tool • Understandings of API calls <p><u>Practical Activity</u></p> <p>Practice to monitor the performance of application</p>	Total- 27 Hrs Theory- 6 Hrs Practice- 21 Hrs	Desktop PC Cloud account Internet	Computer Lab
LU2. Perform monitoring with stack traces	Trainee will be able to: <ol style="list-style-type: none"> 1. Locate local variables in Stack for prod errors 2. Write custom logics that gets executed on startup 3. Inspect errors on runtime 4. Extract additional errors from frame for any local variable 	<ul style="list-style-type: none"> • Understanding of methods in python • Knowledge of stack traces <p><u>Practical Activity</u></p> <p>Practice to monitor with stack traces</p>	Total- 29 Hrs Theory- 5 Hrs Practice- 24 Hrs	Desktop PC Cloud account Internet	Computer Lab

LU3. Use built-in cloud functions	Trainee will be able to: <ol style="list-style-type: none"> 1. Enable logging using diagnostics 2. Extract application`s insight 3. Demonstrate visual profiling 4. Sync the remote desktop to the host Machine 	<ul style="list-style-type: none"> • Knowledge of switch virtual interfaces, its usage & benefits • Knowledge about building function of cloud • Knowledge of Ethernet <p><u>Practical Activity</u></p> <p>Practice to synchronies the remote desktop</p>	Total- 23 Hrs Theory- 5 Hrs Practice- 18 Hrs	Desktop PC Cloud account Internet	Computer Lab GNS3 Packet Tracer
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Module 13 Develop API functions

Objective: After this competency, standard candidate will be able to develop API functions.

Duration: 79 Hours

Theory: 16 Hours

Practice: 63 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Design the API	Trainee will be able to: <ol style="list-style-type: none"> 1. Build new services using REST (RE presentational State Transfer) or SOAP (Simple Object Access Protocol) 2. Attach to business capability 3. Gather resources from published information model 4. Choose suitable resource methods 5. Configure API security 	<ul style="list-style-type: none"> • Knowledge about API • Understanding of APIs Security • Knowledge of cloud protocols <u>Practical Activity</u> Practice to design the API	Total- 27 Hrs Theory- 6 Hrs Practice- 21 Hrs	Desktop PC Cloud account Internet Open source API	Computer Lab
LU2. Perform Virtualization on API's	Trainee will be able to: <ol style="list-style-type: none"> 1. Utilize realistic data to fetch responses 2. Isolate API operations 3. Simulate network conditions and server capacity 4. Load test on virtual API's 	<ul style="list-style-type: none"> • Knowledge about virtualization <u>Practical Activity</u> Perform virtualization on APIs	Total- 26 Hrs Theory- 5 Hrs Practice- 21 Hrs	Desktop PC Cloud account Internet Open source API	Computer Lab

LU3. Build API's business logic	Trainee will be able to: <ol style="list-style-type: none"> 1. Apply the business logic 2. Apply security for Public API 3. Expose Database tables as REST resources 4. Test the APIs 	<ul style="list-style-type: none"> • Knowledge about REST • Understandings of public API for business logic • Understanding of QA principals <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to build the API as per scenario • Practice to Test the APIs as per scenario 	Total- 26 Hrs Theory- 5 Hrs Practice- 21 Hrs	Desktop PC Cloud account Internet Open-source API	Computer Lab

Module 14 Build application by using Command Line Interface (CLI) and Software Development Kits (SDK)

Objective: After this competency, standard candidate will be able to write application using command line and SDK's

Duration: 104 Hours

Theory: 11 Hours

Practice: 93 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Virtual Environment (Virtualenv) functionality	Trainee will be able to: <ol style="list-style-type: none"> 1. Isolate project on using virtualenvs 2. Use pip to install virtualenv or use Pycharm as you're IDE (as guided by instructor) 	<ul style="list-style-type: none"> • Basic knowledge of Virtualization • Creation of virtual environment • Knowledge about the virtualenv <u>Practical Activity</u> Create virtual environment for Application	Total- 35 Hrs Theory- 5 Hrs Practice- 30 Hrs	Desktop PC Cloud account Internet Open-source API	Computer Lab
LU2. Request library through python	Trainee will be able to: <ol style="list-style-type: none"> 1. Gather information from other applications. 2. Integrate data using JSON or XML format. 3. Run pip install requests command in shell 	<ul style="list-style-type: none"> • knowledge of JSON, XML <u>Practical Activity</u> Request library through python	Total- 33 Hrs Theory- 3 Hrs Practice- 30 Hrs	Desktop PC Cloud account Internet Open-source API	Computer Lab

LU3. Manage vulnerabilities	Trainee will be able to: <ol style="list-style-type: none"> 1. Import search function from web scraper 2. Pass keyword argument from command line. 3. Run a lookup function from web scrapper 4. Parse the name argument command 	<ul style="list-style-type: none"> • Knowledge of web scrapper, lookup tool <p><u>Practical Activity</u></p> <p>Practice to manage vulnerabilities as per scenario.</p>	Total- 36 Hrs Theory- 3 Hrs Practice- 33 Hrs	Desktop PC Cloud account Internet Open-source API	Computer Lab
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Module 15 Create Virtual Machines/Hypervisor in a Datacenter

Overview: This unit describes the skills and knowledge required to learn virtualization, hypervisor, network virtualization and VM operations as well as troubleshooting of VM

Duration: 80 Hours

Theory: 15 Hours

Practical: 65 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Create virtual machine	Trainee will be able to: <ol style="list-style-type: none"> 1. Install hypervisor 2. Open the hypervisor 3. Install a guest OS 	<ul style="list-style-type: none"> • knowledge of Linux operating system • Understanding of Linux file system • Knowledge of hypervisors • Virtual machines. • Understanding of Virtual resources <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Practice to install Hypervisor as per scenario on local 	Total- 38 Hrs Theory- 8 Hrs Practice- 30 Hrs	Computer System Internet Connection Operating System Hypervisor software	Class Room and Computer Lab

		PC/Server <ul style="list-style-type: none"> Practice to create virtual machines 			
LU2. Manage networking of Virtual Machine	Trainee will be able to: <ol style="list-style-type: none"> Open hypervisor Open guest OS Assign IP address to the VM Connect the VM with others VM as per instruction Perform operations on VM Clone a VM create a VM template Troubleshoot the VM 	<ul style="list-style-type: none"> knowledge of virtual interface in Hypervisor Understanding of virtual switch knowledge Cloning of virtual machines Understanding of VM, clone, VM template <u>Practical Activity</u> <ul style="list-style-type: none"> Practice to assign IPs to Virtual machines and make network Practice to clone the virtual machine Take the whole backup of virtual machine Troubleshoot the VMs as per scenario 	Total- 42 Hrs Theory- 7 Hrs Practice- 35 Hrs	Computer System Internet Connection Operating System Hypervisor software	Class Room and Computer Lab

Module 16 Manage Virtual Machines/Hypervisor

Overview: This unit describes the skills and knowledge required to learn management of virtual machines/hypervisor, disaster and recovery management as well as monitoring.

Duration: 63 Hours

Theory: 12 Hours

Practical: 51 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Modify the Virtual Machines	Trainee will be able to: <ol style="list-style-type: none"> 1. Identify the modification requirement for virtual machine 2. Run the hypervisor 3. Assign the required resources 4. Verify the resources 	<ul style="list-style-type: none"> • Knowledge about customizing the virtual machines. • Understanding of different components of VMs. i.e. storage, Networks <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Modify the virtual machines as per scenarios 	Total- 12 Hrs Theory- 3 Hrs Practice- 9 Hrs	Computer System Internet Connection Operating System Hypervisor software	Class Room and Computer Lab
LU2. Create Virtual Machine Snapshots	Trainee will be able to: <ol style="list-style-type: none"> 1. Run the hypervisor 2. Create snapshot 	<ul style="list-style-type: none"> • Knowledge snapshot of VM • Understanding of 	Total- 12 Hrs Theory-	Computer System	Class Room and

	3. Save the snapshot as instructed	<p>disaster and recovery concepts in virtualization</p> <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Create snapshot of the VMs in hypervisor 	3 Hrs Practice- 9 Hrs	Internet Operating System Hypervisor software	Computer Lab
LU3. Perform Resource Management and Monitoring	<p>Trainee will be able to:</p> <ol style="list-style-type: none"> Run the hypervisor Install the required tool for management Install the required tools for monitoring of VMS Monitor assigned resources utilization 	<ul style="list-style-type: none"> Knowledge monitoring tools in hypervisor. <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Monitor the performances of CPU, Hard disk and network 	Total- 11 Hrs Theory- 2 Hrs Practice- 9 Hrs	Computer System Internet Connection Operating System Hypervisor software	Class Room and Computer Lab
LU4. Troubleshoot the network connectivity	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Check the network connectivity issue Inspect the network through various third-party tools Modify the setting Verify the connectivity 	<ul style="list-style-type: none"> Host and guest machines Characteristics of virtual switch Virtual PBX work <p><u>Practical activity :</u></p> <ul style="list-style-type: none"> Find and resolve the Repetitive IP address 	Total- 14 Hrs Theory- 2 Hrs Practice-	Computer System Internet Connection Operating	Class room , Lab

		Entry Issue <ul style="list-style-type: none"> Verify the duplex mode and speed as well. Send traffic to and from the host and guest OSs 	12 Hrs	System Hypervisor software	
LU5. Troubleshoot the allocated resources	The trainee will be able to: <ol style="list-style-type: none"> Identify the resource issue Inspect the network through various third-party tools Modify the setting as per instructions Verify the solution 	Knowledge of: - <ul style="list-style-type: none"> Knowledge of virtual machine common issues <u>Practical Activity:-</u> <ul style="list-style-type: none"> Create a password policy and log on to a system with a valid account and change the password to meet strong password requirements 	Total- 14 Hrs Theory- 2 Hrs Practice- 12 Hrs	Computer System Internet Connection Operating System Hypervisor software	Class room , Lab

Module 17: Perform Basic Green Skills

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic green skills.

Duration: 30 hours

Theory: 10 hours

Practical: 20 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Manage sustainability of materials	The trainee will be able to: <ol style="list-style-type: none"> 1. Select sustainable raw materials as per requirement 2. Follow standard procedure to manage systems (waste, energy, water) 3. Perform impact quantification of used material 	<ul style="list-style-type: none"> • Environmental degradation • Types of waste • Waste reduction techniques • Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink) • Reusable materials • Recyclable materials • Methods for disposal of unusable materials • Just-in-time (JIT) approach • Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.) 	Total: 15hrs Theory: 05hrs Practical: 10hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pen Non Consumable <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system 	Classroom/ working site

LU2: Manage waste	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify various types of waste at site 2. Sort and categorize reusable waste 3. Dispose unusable waste as per set standards 4. Place reusable material at designated storage area 	<ul style="list-style-type: none"> • Environmental degradation • Types of waste • Waste reduction techniques • Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink) • Reusable materials • Recyclable materials • Methods for disposal of unusable materials • Just-in-time (JIT) approach • Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.) 	Total: 15hrs Theory: 05hrs Practical: 10hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pen <div>Non-Consumable</div> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system 	Classroom/ working site
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General assessment guidance for “Computer Networking and Computing” “Cloud Configuration Assistant”

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final assessment is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of Computer Networking and Computing:

- Work performances, for example Create a simple app using app inventor that connects with Arduino board over Bluetooth and receive the sensor data to be displayed.
- Work Performances, for example Develop a regulated power supply that will power up your digital circuit

- Demonstrations, for example Design a Fan dimmer circuit.
- Direct questioning, where the assessor would ask the student why he is preparing for a particular application.
- Paper-based tests, such as short answer questions on health and safety, communication skills etc.

Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of Computer Networking and Computing include:

- Work products, CN & CC Project portfolio
- Workplace documents, such as a report on health and safety etc.

Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess, for example, let's imagine if you have thousands of sensors, collecting various data all around us. A solution that scale would be to have these microcontrollers sending data securely to the Cloud.

Reliability means that the assessment is consistent and reproducible. The results for the particular application should be the same.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

Assessment strategy for “Computer Networking and Computing” “Cloud Configuration Assistant”

This curriculum consists of 17 modules

1. Install Server Operating System
2. Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)

3. Configure Basic Wireless Network
4. Perform Window Based Network Administration
5. Perform LINUX Based Network Administration
6. Manage Video Conference and Meeting
7. Install configure CCTV and NVR
8. Perform NAS Configuration
9. Develop Programs Using Object Oriented Concepts
10. Perform Deployment of Cloud Application
11. Develop Application on any High-Level Programming Language
12. Perform Debugging of Cloud Application
13. Develop API Function
14. Build Application by Using Command Line Interface (CLI) and Software Development Kits (SDK)
15. Create Virtual Machines/Hypervisor in Data centre
16. Manage Virtual Machines/Hypervisor
17. Perform Basic Green Skills

Sessional assessment

The Sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The Sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper lasting at least half-hour per module. This can be short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The final theoretical assessment shall consist of short-answer questions. This part shall cover the technical, functional and generic modules:

For Level -4

1. Install Server Operating System
2. Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)
3. Configure Basic Wireless Network
4. Perform Window Based Network Administration
5. Perform LINUX Based Network Administration
6. Manage Video Conference and Meeting
7. Install configure CCTV and NVR
8. Perform NAS Configuration
9. Develop Programs Using Object Oriented Concepts
10. Perform Deployment of Cloud Application
11. Develop Application on any High-Level Programming Language
12. Perform Debugging of Cloud Application
13. Develop API Function
14. Build Application by Using Command Line Interface (CLI) and Software Development Kits (SDK)
15. Create Virtual Machines/Hypervisor in Data centre

16. Manage Virtual Machines/Hypervisor

17. Perform Basic Green Skills

For the final practical assessment each student shall be assessed over a period of one day, with Four hour sessions for each student. During this period, each student must be assessed on his/her ability to the following parameters of security services;

- Area of responsibility
- Tasks
- Guards
- Resources and duties

Complete list of tools and equipment

Sr#	Description	Quantity
1.	Bootable OS Flash drive/CD	05(5 student groups /01 for each group)
2.	Computer	25
3.	Internet	1
4.	Mouse	25
5.	MS Office	5
6.	Networking Tool Kit	5 kits
7.	Printer	2
8.	Projector	01 for each lab/class
9.	Projector screen	01 for each lab/class
10.	Router	5
11.	Smartphone	2
12.	White board	1 each class/lab
13.	Wireless router	2
14.	UPS	25(One for each computer at leats 20 mints back up)
15.	24 port layer2 switch	3
16.	24 port layer 3 switch	3
17.	Access point	3
18.	Ethernet cables/	One role
19.	Windows Server OS	Down load Free products available on open source
20.	Windows Server OS 2019/2016 etc	Down load Free products available on open source
21.	Zoom Application	Down load Free

		products available on open source
22.	Google meet application	google meet application download for pc
23.	CCTV/IP Cameras	03 with all accessories
24.	NVR	3
25.	Rack	3
26.	Temperature maintain device	5
27.	Physical security	As per requirement of labs and institute
28.	Environmental protection devices	As per requirement of labs and institute
29.	Tools (Operation & Safety) kits	5
30.	Keyboard	25
31.	Super VGA (800 x 600) or higher-resolution monitor	25
32.	Router/ Switch	25
33.	Computer system/ Laptop	25
34.	CCTV	5
35.	Linux OS	Down load Free products available on open source
36.	Tools (Operation & Safety)	5
37.	Hypervisor software	Free available Down load

List of consumable supplies

1. Note books
2. Inventory registers
3. Pen
4. Pencils
5. Sharpeners
6. Erasers
7. White board markers (Different colors)
8. A4 papers
9. Valid cloud subscription
10. LEDs
11. Female to female header wires
12. Male to female header wires
13. Jumper wires
14. Resistances, capacitors, diodes, zener diode, relays, transistor etc.
15. PVC wires
16. Digital gates
17. Diac,
18. Triac,
19. FETs
20. RJ 45,
21. Category 5 &6 cable
22. Coaxial cable
23. DVD RWR
24. Soldering wire
25. Soldering paste
26. Two way switch
27. One way switch
28. AND gate (7408 2-input Quad)
29. Coupling capacitors
30. DIAC
31. Diodes
32. FET (JFET/MOSFET)
33. Humidity Sensor
34. IC 74147
35. IC 7445 BCD to decimal decoder
36. Inductors
37. Lamp
38. LM741 IC
39. Load (LED)
40. MOSFET
41. NAND gate (7400 2-input Quad)
42. Network cable CAT5,CAT6
43. NOR gate (7402 2-input Quad)
44. Power diodes (general purpose, Fast recovery &Schottky)
45. Push Button
46. PVC Pipe/Duct.
47. Resistive load
48. RFID tags

49. Safety procedures
50. Safety signs
51. SCR
52. Seven segment display
53. Single pole switch
54. Socket
55. Solenoid Valves
56. Temperature Sensor
57. Test Indicator.
58. TRIAC
59. UJT
60. White Board marker
61. Wooden/PVC board.
62. X-NOR gate (74266 2-input Quad)
63. X-OR gate (7486 2-input Quad)
64. Zener Diode
65. IR Sensor
66. IR Ultrasonic Sensor
67. NOT gate (7404 Hex NOT gate)
68. NOT gate (7404 Hex)
69. Occupancy Sensor
70. One 7404 IC – hex inverter (NOT gate)
71. OR gate (7410 3-input)
72. OR gate 7432 2-input Quad

Credit values

The credit value of the National Certificate Security Services is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines).

The credit values are as follows:

Competency Standard	Estimate of hours	Credit
1. Install Server Operating System	49	4.9
2. Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)	60	6
3. Configure Basic Wireless Network	49	4.9
4. Perform Window Based Network Administration	60	6
5. Perform LINUX Based Network Administration	104	10.4
6. Manage Video Conference and Meeting	48	4.8
7. Install configure CCTV and NVR	48	4.8
8. Perform NAS Configuration	48	4.8
9. Develop Programs Using Object Oriented Concepts	107	10.7
10. Perform Deployment of Cloud Application	77	7.7
11. Develop Application on any High-Level Programming Language	104	10.4
12. Perform Debugging of Cloud Application	90	9
13. Develop API Function	79	7.9
14. Build Application by Using Command Line Interface (CLI) and Software Development Kits (SDK)	104	10.4

Competency Standard	Estimate of hours	Credit
15. Create Virtual Machines/Hypervisor in Data centre	80	8
16. Manage Virtual Machines/Hypervisor	63	6.3
17. Perform Basic Green Skills	30	3

Members of Curriculum Validation Committee

The following members participated in the qualification validation process at PITAC, Lahore.

Date: 20th to 24th Dec, 2021

S#	Name	Designation
1.	Ms Saima Asghar	DACUM expert, Lahore
2.	Mr Muzammil Hasan	Manager Research, KICS, UET, Lahore
3.	Mr Muhammad Akram	Manager Telecom Networks, Faisalabad
4.	Mr Kashif Bashir	Manager KICS, UET Lahore
5.	Mr Azhar Hussain	Sr Team Lead systems, Orient petroleum, Inc Islamabad
6.	Mr Ameer Hamza	Network Manager, ST&IT department KPK Peshawar
7.	Engr Muhammad Aleem	Industrial Automation Department University of Sargodha (CBT&A assessor)
8.	Dr Ahmad Mustafa	PTEVTA, Lahore
9.	Mr Atif Bashir	Project Manager, NCBA &E west Canal, Lahore
10.	Muhammad Abdul Moez	Structural Engineer, RMCE Lahore
11.	Mr. Sadiq Orakzai	Director Academics, KPK TEVTA
12.	Mr Faisal Sarwar	IPS, PBTE Lahore
13.	Mr Abdul Basit	Assistant Programmer, DM&R division, NESPAK Islamabad
14.	Ms Sheeba ch	Networking Incharge, Bahria University Islamabad.
15.	Ms Samia Amir Hamza	CBT Assessor, Expert, GCU Faisalabad