

**DRAFT Syllabus For Computer Hardware & Networking**

<b>Course Name</b>	<b>Computer Hardware &amp; Networking</b>
<b>Course Code</b>	<b>STC - ITE/NSQF-2021/2110</b>
<b>Occupation</b>	Computer Hardware & Network Maintenance Assistant
<b>Job Description</b>	The person will help in computer related operation and function involved in office activities regarding software installation, Hardware maintenance, network maintenance etc. He will also assist Hardware Analyst and Network Administrator
<b>Anticipated Volume of Training</b>	1200 Hrs (Theory: 200 Hrs + Practical: 610 Hrs + Employability Skill: 90 Hrs. + OJT 300 Hrs.)
<b>Trainees' Entry Qualification</b>	Class 8 Pass + ITI (2 Yrs) with 2 years experience, OR Class 10 Pass + ITI (1Yr) after class 10 with 1 year experience, OR Class 10 Pass + ITI (2 yrs) after class 10, OR Class 10 Pass with 2 years experience, OR Class 10 Pass and pursuing continuous regular schooling, OR 3 years diploma after class 10 or Class 12 Pass with 6 months experience, OR Previous Relevant Qualification of NSQF Level 3 with 2 yrs experience.
<b>Trainers Qualification</b>	M.E./M.TECH IN ELECTRONICS / ELECTRICAL ENGINEERING / COMPUTER SCIENCE / IT, B.E/B.TECH IN ELECTRONICS / ELECTRICAL ENGINEERING / COMPUTER SCIENCE / IT, 2 Years' Experience.

**Structure of Course:**

<b>Module No.</b>	<b>Module name</b>	<b>Outcome</b>	<b>Theory (Hrs)</b>	<b>Practical (Hrs)</b>	<b>Total (Hrs)</b>
1	Computer Fundamentals & Basics of Power System in a Computer.	Identify different parts of a computer system	10	60	50
2	Introduction to SMPS & UPS.	Install Test and Troubleshoot Switch Mode Power Supply & UPS (Uninterrupted Power Supply).	10	60	50
3	Introduction to Basic Input Output System.	Demonstrate configurations and changes in BIOS or CMOS Setup and POST(Power on Self-Test)	5	50	35
4	Introduction to Operating System.	Install an OS in a new Computer System and configure the machine.	10	60	50
5	Computer Management.	Manage the resources of a Computer System (Windows and or Linux) according to users need.	10	60	50
6	Disk Partitioning	Create partition of the HDD, SSD of a Computer System (in Windows and or Linux) according to users need.	10	50	40

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs)
7	Details about Central Processing Unit & Main board	Install a CPU on motherboard & underlying technology used.	30	70	70
8	Primary and Secondary Memory.	Install RAM, SSD, HDD and explain Primary Memory (RAM & ROM) and Secondary Memory in a computer system.	30	70	70
9	Computer Accessories	Install & connect accessories like optical drive, keyboard, mouse, monitor, Printer and troubleshoot them.	10	50	40
10	Virus/ Malwares	Identify different types of Virus attack and take suitable course of action to disinfect a system.	05	40	25
11	Data Communications and Networking.	Explain Working Principle of Communication and utility of Network in a big System.	30	60	60
12	Knowledge of Network Topologies, Networking Devices, Transmission Media, Sharing of resources.	Connect computers in a networking system and able to share, files, printers or other resources in a system.	30	60	60
13	Knowledge of Internet & Internet Network Configuration	Configure the router or modem and setup a secured connection via Internet.	10	30	20
TOTAL:			200		

**Employability Skill: 90 Hrs**

**SYLLABUS:**

**Module No. 1:** Computer Fundamentals & Basics of Power System in a Computer.

**Outcome**

Identify different parts of a computer system

**Theory Content:**

- 1.1. Computer Fundamentals History and Generations of Computer (Gen 1 to 5).
- 1.2. Architecture of the Computer.
- 1.3. Description of Different parts of a computer.
- 1.4. Idea about System Software and Application Software. Operating system concept (Basic knowledge).
- 1.5. Fundamentals of Electricity, About AC and DC
- 1.6. How AC is converted into DC in a Computer

**Practical Content:**

- 1.1. Identification of different Components of a computer and demonstration and uses of them.
- 1.2. Different Tools / equipment used for assembling/ disassembling a PC.
- 1.3. Demonstrations of the power flow inside a computer through slides/ PPT.
- 1.4. Identification of the power source, coloured wires of interest etc.

**Module No. 2: Introduction to SMPS & UPS.****Outcome**

Install Test and Troubleshoot Switch Mode Power Supply & UPS (Uninterrupted Power Supply).

**Theory Content:**

- 2.1. SMPS Features, Functions.
- 2.2. Types of SMPS
- 2.3. Power distribution in SMPS
- 2.4. Components and Circuits inside the SMPS Unit
- 2.5. Types of UPS Offline, Line Interactive & Online.
- 2.6. Working Principle of each type of UPS.
- 2.7. Connecting, Maintenance and Troubleshooting.

**Practical Content:**

- 2.1. A running SMPS demonstration
- 2.2. Installation of a SMPS on a cabinet
- 2.3. Isolated Power testing by sorting.
- 2.4. Live UPS Demonstration.
- 2.5. Changing dead battery from an UPS.
- 2.6. Troubleshooting -relay, fuse and Circuits.

**Module No. 3: Introduction to Basic Input Output System.****Outcome**

Demonstrate configurations and changes in BIOS or CMOS Setup and POST(Power on Self-Test)

**Theory Content:**

- 3.1. Introduction to BIOS/CMOS Setup, POST(Power on Self-Test)
- 3.2. Demonstration of BIOS/CMOS Configuration (Date, Time, Enable/Disable Devices).
- 3.3. Dual BIOS Feature BIOS/CMOS Setup, Booting Sequence/Boot Order

**Practical Content:**

- 3.1. Demonstration of BIOS / CMOS setup, POST in a Computer step by step.
- 3.2. Demonstration of different types of configurations and effect of changes in an existing BIOS feature for a system.
- 3.3. Implementation of Dual Booting setup preferably in windows with Linux (Ubuntu). **May be clubbed with Module 4.**

**Module No. 4: Introduction to Operating System.****Outcome**

Install an OS in a new Computer System and configure the machine.

**Theory Content:**

- 4.1. Definition and types of Operating Systems. Functions & Features of OS.
- 4.2. MS-Dos (Prelims), Windows 8.1, 10, 11, Red Hat 7 / Fedora Linux Server, Ubuntu, MAC OS, Android etc.
- 4.3. Process of Booting the Operating System.
- 4.4. Installation of Windows 8.1, 10, 11 Activation and Automatic Updating procedures.
- 4.5. Installation of Linux Server and Creating groups with file/ resource permission.

**Practical Content:**

- 4.1. Installation of different types of OS mentioned in module 4.2. Hands on practices of basic Dos command in cmd prompt.
- 4.3. Demonstration on Windows Using: Safe Mode, Safe Mode Boot options, Last Known Good Configuration, etc.
- 4.4. Demonstrating Windows Diagnostic Tools, System Restore, Creating Restore point, restore using Restore point, etc.
- 4.5. Windows Recovery using System Factory Defaults/Recovery tools
- 4.6. Installation of driver routines for the system.
- 4.7. Linux Server Configuration and manage devices.

**Module No. 5: Computer Management.****Outcome**

Manage the resources of a Computer System (Windows and or Linux) according to users need.

**Theory Content:**

- 5.1. Computer Management, Disk Management, Defragmentation.
- 5.2. Services and Applications, Local Users and Groups.
- 5.3. Advanced System Settings, Device Manager, Task Manager, Windows Registry.
- 5.4. Different Service management by Linux using **systemctl** command.

**Practical Content:**

- 5.1. Demonstrating computer management in Windows using Disk manager, Shrink, Extend, and Creating Logical Drive etc.
- 5.2. Creating users, groups etc.
- 5.3. Installing & uninstalling program, devices driver from control panel, uses of task manager, termination of a process etc.
- 5.4. Start or stop services in Linux from super user prompt (#) using system service-related commands.

**Module No. 6: Disk Partitioning****Outcome**

Create partition of the HDD, SSD of a Computer System (in Windows and or Linux) according to users need.

**Theory Content:**

- 6.1. Partitioning of Hard Drive/ SSD - Primary, Extended, Logical partitions using Partition Tools in Windows.
- 6.2. Partitioning of Hard Drive/ SSD - Primary, Extended, Logical partitions using Partition Command (mkpart) in Linux.

**Practical Content:**

- 6.1. Demonstration of Partitioning of Hard Drive/ SSD - Primary, Extended, and Logical partitions using Partition Tools in Windows through Disk Manager.
- 6.2. Demonstration of Partitioning of Hard Drive/ SSD - Primary, Extended, and Logical partitions using Partition Command (mkpart) in Linux.
- 6.3. Disk Imaging using Ghost Tools like Norton Ghost, Disk Imaging etc. Creating and Restoring Partition Images and Disk images. Using Ghost tools for Disk to Disk and Partition to Disk Ghosting.

**Module No. 7: Details about Central Processing Unit & Main board****Outcome**

Install a CPU on motherboard & underlying technology used.

**Theory Content:**

- 7.1. Definition of CPU, Architecture, Speed, Types of CPU (XT and AT technologies) 32/64 Bit.
- 7.2. Types process or technologies like Clock speed, Bus speed, Cache memory.
- 7.3. Threading technologies, Core technologies, IRQ & DMA Technologies.
- 7.4. Brands (Intel/AMD), CPU Series –like Pentium, PI, PII, PIII, PIV etc.
- 7.5. What is "I" Technology, Core series (i3, i5, i7).
- 7.6. To explain about PGA and BGA and LGA Model processors, Pins/sockets.
- 7.7. Definition, Architecture, Compatibility with CPU's, Chipsets and Brands.
- 7.8. What is Chipset, what is FSB, what is Bus, CPU Sockets, Interface Ports used to connect different Peripherals.
- 7.9. I/O Ports (PS/2, Serial, Parallel, USB, VGA, HDMI, Audio, Ethernet, etc.)
- 7.10. Identifying Expansion Slots (PCI, AGP etc.), Power Form Factor.

**Practical Content:**

- 7.1. Demonstration of different generation CPU (Intel /AMD), showing clock speed, Bus speed & other features.
- 7.2. Demonstration of technological difference between different generations's CPU through slides, lecture, picture etc.
- 7.3. Hand on practice to install CPU on the slot provided on the compatible main board.
- 7.4. Demonstration of different generation's main board (Intel /AMD/ 3<sup>rd</sup> party) compatible with the system, showing clock speed, Bus speed & other features.
- 7.5. Demonstration of different port and interfaces through hand on practices, slides, lecture, and picture as mentioned in theory classes.
- 7.6. Hand on practice to install CPU on the slot provided on the compatible main board.
- 7.7. Installation of external cards viz. graphics, sound, Ethernet etc. on the main board.

**Module No. 8: Primary and Secondary Memory.****Outcome**

Install RAM, SSD, HDD and explain Primary Memory (RAM & ROM) and Secondary Memory in a computer system.

**Theory Content:**

- 8.1. Introduction to RAM, ROM, Cache Memory, Buffer Memory, Virtual Memory. Speed, Timeline (EDO, NON-EDO, SD, RD, DDR, DDR2, DDR3, DDR4), Hybrid Memory.
- 8.2. Comparing and Installing RAM, Memory Module Form Factor, etc.
- 8.3. Introduction to HDD& SSD, Types, Functioning of HDD, Functioning of SSD, Dual Usage.
- 8.4. Interface Types of HDD & SSD (IDE or PATA, SATA, SCSI, PCI -E, MSATA, M.2), Data storage technique.
- 8.5. Tracks, Sectors, Cylinders, Cluster MBR, FAT Area, DIR Area, Zero Track
- 8.6. IDE Jumper settings (Primary/Secondary),(Master/Slave/Cable Select).
- 8.7. Installing and Configuring a New HDD / SSD.

**Practical Content:**

- 8.1. Demonstration of different generation's RAM compatible with the system, showing speed, & other features.
- 8.2. Hand on practice to install RAM on the slot provided on the compatible main board.
- 8.3. Demonstration of different types of HDD/SSD, showing speed, characteristics & other features.
- 8.4. Hand on practice to install HDD / SSD or both in a System.
- 8.5. Hands on practice to make a HDD /SSD as Primary/ Secondary Master / Slave using IDE Jumper settings or cable select.
- 8.6. Fresh installation a HDD/SSD, Partition, Installation of OS, Application S/W.

**Module No. 9: Computer Accessories****Outcome**

Install & connect accessories like optical drive, keyboard, mouse, monitor, Printer and troubleshoot them.

**Theory Content:**

**Optical Drive**

- 9.1 Types of Optical Drives -ROM/Writer,
- 9.2 Types of Media-(CD/DVD/ Blu-ray),
- 9.3 Difference between Red Ray technology Drives and Blue Ray Technology Drives.
- 9.4 Layers of CD and DVD,Difference between CD and DVD.
- 9.5 Storage Technology - Reading, Writing & Re Writing data, Drive Interfaces -(IDE/SATA).
- 9.6 Burning CD/DVD's using multiple Burning Tools, i.e., Nero, NTI, etc.
- 9.7 Creating, Managing and Burning ISO Images using tools like: Magic ISO, Power ISO etc.

**Keyboard & Mouse**

- 9.8 Types of Keyboards (Membrane / Mechanical), Keyboard Layout.
- 9.9 Working Principles of Keyboard (Make/Brake Scan Code, Key Matrix).
- 9.10 Keyboard Interfaces (DIN Type, PS/2, USB, wireless).
- 9.11 Keyboard Problems and Troubleshooting.
- 9.12 Types of Mouses (Ball Mouse, Optical Mouse, Trackball).
- 9.13 Principles of Mouse(X, Y Axis in Ball Mouse & DSP, Sensor in Optical Mouse). Mouse Interfaces( Serial, PS/2,USB,wireless), Mouse Problems and Troubleshooting

**Monitor**

- 9.15 Types of Monitors (CRT/LCD/LED), Working Principles of each type
- 9.16 Demonstration and Practical on Monitor Installation, Menu Configuration, Adjusting Monitor Settings, Monitor Power Supply types, Possible Problems and Troubleshooting.

**Printer**

- 9.17 Types of Printers (Dot Matrix, Inkjet, Laser, Thermal, All-in-One Printers, etc.), Interface Cables, Ports & Connectors.
- 9.18 Working Principles of each type, network Printer.
- 9.19 Installing a Printer and Configuring Drivers.
- 9.20 Possible Printer Problems and Troubleshooting Techniques.
- 9.21 Types of Scanners (Handheld, Flatbed, Sheet fed, Portable Scanners). Interface Cables, Ports &Connectors.
- 9.22 Working Principles of each type.
- 9.23 Installation of Scanner, Device Driver Installation.
- 9.24 Scanner Settings, Scanning Documents, Photos in different Formats like JPG, PDF etc.

**Practical Content:****Optical Drive**

- 9.1. Demonstration of different types of Optical Disk. Jumper Settings.
- 9.2. Hand on practice to learn on burning through requisite application Software.
- 9.3. Connecting drives with the system with different interfaces.
- 9.4. Hand on practice on Burning CD and DVD to create ISO image of software.
- 9.5. Creating Recovery Image or Media(CD/DVD/ Pen drive) using Tools like Acronis Backup/ Recovery and Restoring the Image or Media.

**Keyboard & Mouse**

- 9.6 Demonstration of different types of Keyboards.
- 9.7 Keyboard problems and Troubleshooting.
- 9.8 Hands on practice with different types of mice.
- 9.9 Mouse Problems and Trouble shooting.

**Monitor**

- 9.10 Hands on practice with different types of mice.
- 9.11 Mouse Problems and Trouble shooting.

**Printer**

- 9.12 Demonstration of different types of Printers (Dot Matrix, Inkjet, Laser, Thermal, All-in-One, network Printers etc.)
- 9.13 Installing a Printer and Configuring Drivers.
- 9.14 Printer Problems and Troubleshooting Techniques.
- 9.15 Demonstration of different types of Scanners (Handheld, Flatbed, Sheet fed, Portable Scanners).
- 9.16 Installing a Scanner and Configuring Drivers.
- 9.17 Scanner Problems and Printer Trouble shooting Techniques.
- 9.18 Hands on Practice of Assembling and disassembling a PC with accessories.

**Module No. 10: Virus/ Malwares****Outcome**

Identify different types of Virus attack and take suitable course of action to disinfect a system.

**Theory Content:**

- 10.1 What is a computer virus? How Virus Attacks a computer.
- 10.2 Types of Viruses (Boot Sector Virus, Partition Virus, File Virus, Trojans, Etc.)
- 10.3 Malwares, Adwares, Spywares, Phishing Attacks, etc. Prevention and Curing Virus and Spywares.
- 10.4 Antivirus, Internet Security Tools, Updates etc.

**Practical Content:**

- 10.1 Hands on practice with different types of Security measures that might be imposed for a safe system.
- 10.2 Internet protocols and security breach.
- 10.3 Antivirus software, types, installation, Mechanisms.

**Module No. 11: Data Communications and Networking.****Outcome**

Explain Working Principle of Communication and utility of Network in a big System.

**Theory Content:**

- 11.1 Identify various network media needed to make successful LAN and WAN connections and their distinct roles.



- 11.2 Understanding the basic concepts of Client, Server, Workstation, Hubs and their applications.
- 11.3 Understanding different types of Network architectures: Peer-to-Peer, Client-Server and Distributed.
- 11.4 Basic concept of Transmission Types: Simplex, Half duplex and full duplex Mode.

**Practical Content:**

- 11.1 Demonstration of different types of Network Implementation through Slides / Pictures.
- 11.2 Demonstration of Client, Server, Workstation, Hubs and their applications through Slides / Pictures.
- 11.3 Hand on Practice to identify Peer-to-Peer, Client-Server and Distributed network system.
- 11.4 Transmission media types Identification.

**Module No. 12:** Knowledge of Network Topologies, Networking Devices, Transmission Media, Sharing of resources.

**Outcome**

Connect computers in a networking system and able to share, files, printers or other resources in a system.

**Theory Content:**

- 12.1 Identify different topologies used in networking with their relative advantages and disadvantages.
- 12.2 Understanding the knowledge about various types of networking devices and media with their usage.
- 12.3 IP addressing, MAC addressing, Install and configure a network and configure IP address static and dynamic, DNS, default gateway.
- 12.4 Design, calculate, and apply subnet masks and addresses to fulfill any organization's requirements.
- 12.5 Working with installation of Network card, altering MAC address and revealing original MAC, Knowledge of making crossover and straight cable.
- 12.6 Introduction to windows networking.
- 12.7 Introduction to Linux Networking. Configuring IP Address on Linux Systems.

**Practical Content:**

- 12.1 Crimping RJ45 Connectors, CAT V/ VI wired Colour Matching for Type A and Type B Connection.
- 12.2 Hand on practice for communication to windows networking.
- 12.3 Data Sharing, Printer Sharing.
- 12.4 Remote Desktop Connection using Windows RDC.
- 12.5 Creating Shared Folders for each user, Assigning Access Rights and Changing Ownership for Shared Folders using File Server Wizard.
- 12.6 Installing, Configuring Windows Server, DNS, ADS, DHCP Configuration.
- 12.7 Print Sharing in Linux OS, and sharing between Windows & Linux systems using SAMBA services.

**Module No. 13:** Knowledge of Internet & Internet Network Configuration

**Outcome**

Configure the router or modem and setup a secured connection via Internet.

**Theory Content:**

- 13.1 Introduction to Internet, Uses of Internet, Working on Internet using various browsers like Edge, Chrome, Firefox, Opera, etc. Explaining URL, HTTP, HTTPS, etc. Clearing Browser Cache.
- 13.2 Creating Mail ID's, Send/Receive Mails, Mail Client Configuration using Outlook/Thunder bird, etc.
- 13.3 Internet Configuration using ADSL Router / Modem.
- 13.4 Introduction to Network Devices: ADSL Router, Wi-Fi Router, Wireless Access Point. Firewall concepts.
- 13.5 Configuring and securing Wireless Networks and Access Points, SSID.
- 13.6 Providing Wireless Client Access with Secure Key and MAC Filtering.

**Practical Content:**

- 13.1 Hand on practices on internet, mail and browser properties, security settings.
- 13.2 Configuring mailbox with Outlook.
- 13.3 Hands on practice to configure Router and or Modem through Admin.
- 13.4 Hands on practice to configure Router and or Modem through Admin password.
- 13.5 Create and configure SSID for secured Wireless connection through a router / modem.
- 13.6 Practice on different advanced application on router / Wi-Fi modem to produce security filter / firewall in network access.

**List of Tools, Equipment & materials needed for 30 Trainees (Practical)**

SI No	Items with description	Qty
1	Desktop Computer, 32/64 bit i3/i5/i7 or any latest processor, WIFI enabled, License OS antivirus compatible with trade related software, necessary component etc.	20
2	Laptop (Standard)	2
3	Printer (Standard)	1
4	Network Printer (Standard)	1
5	UPS (Standard)	As required
6	LCD Projector (Standard)	1
7	Computer Toolkits (Standard)	2
8	Computer Spares (Standard)	As required
9	Mother board (different make)/ Standard	3
10	Cabinet	3
11	Processor (Different make)	2
12	Hard Disk (Different make)	2
13	External Hard Disk	2
14	Keyboard	2
15	Webcam (Standard)	1
16	Crimping Tool, pliers (Standard)	2
17	Different types of Memory Card	2
18	SMPS Trainer Kit	2
19	SMPS Tester	2
20	RAM (1GB / 512 MB)	As required
21	Wireless Network Adapter	As required
22	Router	1
23	LAN Cable Tester	1
24	Network Cables (Standard)	As required
25	Multimeter	2
26	Consumables Goods	As required

