GENERAL INFORMATION FOR COMPUTER HARDWARE ASSISTANT Under MES

Name of Sector	**ICT**
Name of Module	*COMPUTER HARDWARE ASSISTANT*
MES Code	**ICT 703**
Competency **as per N C O Code**	**3121.1**
Duration of Course	**500 Hours**
Entry Qualification of Trainee	10th Pass
Unit size (No. Of trainees)	20
Power Norms	3.45 KW
Space Norms (Workshop and Class Room)	70 Sq. Mtrs.
Instructors Qualification	B.E. / B.Tech. in Computer Engineering /IT, MCA, B Level with one year Experience **OR** Diploma(three years) in Computer Engineering/IT, BCA,NIELIT A Level with two years of Experience **OR** NTC/ NAC in Computer Hardware & Network Maintenance/ICTSM Trade with three years of Experience
Desirable	Craft Instructor Certificate(CIC)

Job Role:

The role of a **Computer Hardware Assistant** is to support and maintain computer systems, desktops, and peripherals. This includes installing, diagnosing, repairing, maintaining, and upgrading all hardware and equipment while ensuring optimal workstation performance. The person will also troubleshoot problem areas in a timely and accurate fashion, and provide end user training and assistance where required.

In a Nutshell :

- Installing, maintaining and repairing software or hardware
- Troubleshooting different computer issues
- Determining and installing appropriate protection/security measures
- Providing technical support on-site or via phone or email
- Install, configure, and maintain common end user application software. May train and provide assistance to end users.
- Troubleshoots software and hardware problems related to Internet applications.

Terminal Competency: After completion of the training, Participants would be able to:

- Plan and prepare for installation
- Install software/equipment/device system
- Plan and prepare for diagnosis of faults of computer systems
- Diagnose faults of computer systems
- Repair defects in computer systems
- Test systems
- Plan and prepare for configuration
- Configure computer systems
- Inspect and test configured computer systems
- Plan and prepare for the maintenance of computer systems
- Maintain computer systems
- Inspect and test configured/repaired computer system

Syllabus for the Trade of
"COMPUTER HARDWARE ASSISTANT"
<u>Under MES</u>
<u>Duration : 500 Hours. / 13 Weeks / 3 months</u>

Week No.	Practical	Theory
1	***<u>Familiarization with the Institute and Safety</u>*** a) Visits to workshops, labs, office, stores etc., of the institute. b) Demonstration of safety precaution. c) Demo of first aid practice. d) Demo of artificial respiration and practice. e) Demo of electrical safety precautions. **<u>Basic concepts of Electricity –</u>** a)Identify specification of types of fuses. Identification and specification of type of switches. b) Identification of meter types and measuring range. c) Measure voltage and current using Multi-meter (analog-digital). d) Measure DC and AC power using V-I method and using power meter.	a) Punctuality and Discipline expected of trainees. Course duration, methodology and structure of the training program. b) About the institute and infrastructure. c) Safety in moving and shifting heavy and delicate equipments. d) First aid. e) Artificial respiration. f) Electrical safety. g) Concept of current and voltage. AC, DC Supply indicating lamps. Different types of Fuses and their applications. Different types of connectors used in electrical and electronic applications. Different types of switches used in electrical and electronic applications. h) Measuring instruments, MC, MI type, Ammeter, Voltmeter, Multimeter for measuring voltage and current. Construction, characteristics/ features and specification. Digital Multimeter i) Meaning of resistance, continuity and continuity testers. Multimeter for checking continuity. j) Concept of Power and measurement using V&I meter and Power meter.
2	***<u>Resistors, Inductance, Capacitance and Soldering & De-soldering.</u>*** a) Identify different types of resistors from physical appearance. b) Identify resistor value and tolerance using colour code. c) Measuring resistance using Multimeter. d) Soldering and desordering techniques, practice using hook-up wires. Soldering	a) Classification, characteristics and application of different types of resistors.- carbon film, metal film, wire wound, cermets and surface mounted. b) Colour coding of resistors. Calculating Imeasuring resistance value and its tolerance value. Wattage of resistors, specific resistance and their importance. c) Resistors in series and parallel. d) Soft soldering and precautions to be taken for making a good solder joint. Types of solder and need of

	resistors on Tag board. e) Verification of Ohms Law and Kirchhoff's Laws. f)Soldering resistors on PCB. g)De-soldering practice. h) Experiment using P.T.C and NTC resistors. i) Experiment to check VDR's. j) Experiment to check LDR's. k) Test Pots, Presets. l) Identification of different types of inductors and its specifications. m) Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies. n) Demo on self and mutual induction. o) Check step down transformers. p) Rewind a transformer to given specification using winging machine. q) Finding losses and efficiency of given transformers. r) Identifying and testing high frequency transformers used in electronic circuits. s) Identify of different types of capacitors from colour code and typographic code. t) Test working condition of capacitor. Measure capacitance using RLC meter. u) Measure capacitive reactance at different frequencies. v) Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel. w) Find the resonance frequency of a given Series and parallel resonance circuit.	soldering paste. e) Ohms law and Kirchhoff's Laws. f) Printed circuit boards and its application. g) De-soldering tools. h) Temperature dependent resistors and their applications.(PTC and NTC) . i) Voltage dependent resistors (VDR). j) Photoelectric effect, Light Dependent resistors. k) Variable resistors, pots, presets, types and application. Log and Linear resistors. l) Definition of inductance. Properties. Types of inductors and their application. m) Inductive reactance, measuring inductance and inductive reactance. Meaning of lead, lag. Effect of inductor on power factor. Frequency dependence of inductive reactance. n) Self and Mutual inductance. Coefficient of coupling. o) Transformers. Turns ratio. Transformer winding. Winding machines. p) Transformer losses and efficiency. q) Uses, losses, efficiency type of cores and uses for LF, HF, VHF transformer. r) Transformers used in high frequency applications. s) Working principle of capacitors. Electrostatic action, dielectric constant. Unit of capacitance and capacitive reactance. Types of Capacitors-electrolytic, ceramic, polyester, tantalum, mica, surface mounted. Colour coding, and tolerance. t) Measuring capacitance and capacitive reactance. u) Behavior of capacitance at different frequencies. v) Capacitors in series and parallel. w) Meaning of Resonance. Application of resonance. Series and parallel resonance circuits
3	**Electronic Components** – a) Identify terminals of different types of diodes. Record its specifications referring to diode data sheet. b) Plot forward and reverse	a) Semiconductor, intrinsic and extrinsic semi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown voltage.

	characteristics of diode Testing working condition of diodes. c) Construct and test a half wave and full wave diode rectifiers. d) Construct and test a Bridge rectifier with and without filter e) Construct a bridge rectifier with capacitance input filter. f) Draw Zener diode characteristics, Simple voltage regulator using zener diode. g) Identify types transistors based on their physical appearance. Identify the leads of the given assorted types of transistors. h) Quick test given transistors using Multimeter. Identify opens, shorted junctions . i) Wire and find the gain of amplifiers in – CB, CE, CC configurations. j) Practice on identifying and using the controls on a regulated power supply. k) Assemble and test a series regulated power supply. l) Assemble and test a shunt regulated power supply. m) Assemble and test a fixed voltage regulator using 3pin IC. n) Assemble and test a variable voltage regulator using IC. o) Assemble a simple inverter and converter for use with emergency lamp. p) Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures.	b) Different types of Diodes. Diode terminals. Diode specifications using data book. c) Forward and reverse characteristics of diode. Testing diodes using Multimeter. d) Half wave and Full wave rectifiers using diodes. Transformer requirements. Calculating output DC, ripple factor. e) Bridge rectifier. Calculating output DC, ripple factor. f) Filters for rectifiers. Calculating output DC, ripple factor. g) Zener diode-Its characteristics and application for voltage regulation. Calculating the series resistor for required current rating. h) Specifications of a regulated power supply and testing a power supply for its specifications. i) Working principle of PNP, Bipolar transistors. Types of transistors and applications. Leads of transistors and their identification. j) Forward and reverse bias of transistor Junction. General values of junction resistances. Quick testing a transistor-using Multimeter. k) Transistor configuration – CB, CE, CC, alpha, beta. Types of Biasing of transistor amplifiers, comparison and applications. Thermal runaway. Steady and Dynamic characteristics. Testing- get frequency response, gain bandwidth product, signal to noise ratio. l) Unregulated, regulated DC Power supply specifications. Application of different types of power supply for specific application types. m) Series regulator using transistor. Short circuit protection. Overload protection. n) Shunt regulators using transistors. o) Fixed Voltage regulators using IC's. p) Variable voltage regulators using IC's. q) Mains voltage stabilizers. r) Inverters and converters. s) Un-interrupted power supply, types and applications.
4	***DIGITAL ELECTRONICS*** a)Identify the specifications of given digital IC's referring to data books. b) Verify the truth table of two input OR, NOR, AND, NAND, NOT gates.	a) Number systems and conversions. Classification of digital IC's. Use of data book for identification of digital IC's. b) Basic LOGIC GATES and truth table. Boolean algebra.

c) Verify of truth table of multiple input logic gates. d) Verify the truth table of XOR and XNOR Gates. e) Realization of different gate type using NAND gates. f) verification of Boolean laws. g) Realization of half adder & full adder using NAND gates. Realization half subtractor and full subtractor using NAND gates. h) Verification of truth table of 7483- 4bit adder. i) Verifying encoder/ decoder/ multiplexer/ demultplexer IC truth tables. j) Realization and verification of truth table of RS, JK and MS- JK flip-flop. k) Realization and verification of D- flip flop. l) Realization and verficiation of up & down (sync/async) counter. m) Verification of A/D & D/A converter. n) Realization of shift registers using FF. o) Verification of Right-shift, Left- shift registers. p) Verification of Serial-in-parallel out and parallel in serial out of data.	c) Logic families, logic levels, propagation delay. Multiple input gates. d) XOR, XNOR gates and application. e) Simplification of Boolean equations. f) Combinational logic circuits. g) Half adder, full adder, parallel binary adder, half subtractor, full subtractor. h) Commercially available adders/subtractors. i) Comparator, decoders, encoders, multiplexer, demultiplexer. j) Parity generators/checkers. RS Flip – Flop, JK flip-flop, Master- Slave flip-flops. k) Types of triggering and applications. D flip-flops. l) Counters, ripple, synchronous, up-down, scale-n counters. m) Principles of A/D & D/A converter. Commercially available A/D & D/A converters. Applications. n) Shift registers. Types, applications. o) Commercially available shift registers and applications. p) Conversion of serial data into parallel and vice-versa.

5	*__Other Mechanical, Electrical & Electronics Accessories.__* Working with Gears, Belts, Stepper Motor, Drive. Identification and Testing of Sensors. Working with Relays. Identification of different advanced Intel microprocessor chips. Identification of different advanced microprocessor chips other than from Intel. *DeskTop :* *PC Repair Safety:* • *Important Safety Basics* • *Identification, specification and application of basic hand tools.* • *How to handle components to ensure their longevity* • *What one shouldn't wear while working inside a computer* • *The danger of static electricity* • *How to protect a PC from lightning strikes and power outages*	Basics of gears, Belts, Stepper Motor, Drive. Sensors, its types and working principles. Relays, types and its working principles. Introduction to Microprocessor, Pentium processor architecture basics. Timing Circuits, Electronic Display (7 segment, LED, LCD, Plasma, LED matrix. a) *Introduction to computers, classification, generations, applications. Basic blocks of a digital computer.* b) *Hand Tools Basics and Specifications.* a) Types of cabinets, relation with mother board form factor. Precautions to be taken while opening and closing PC cabinet. b) Main devices, components, cards, boards inside a PC(to card or device level only). c) Types and specifications of the cables and connectors used for interconnecting the devices, boards, cards, components inside a PC. d) Precautions to be taken while removing and/or re-connecting cables inside a PC.
6	*Hardware Identification* • *Identify the front and rear panel controls and ports on a PC* • *Cases* • *Cooling* • *Power Supplies* • *Power Supply Connections* • *Motherboard Connections* • *Motherboard Components* • *CPU (Processor)* • *RAM (Memory)* • *Hard Drive Connections* • *Mechanical vs. Solid State Drives* • *ROM Drives* • *Video Cards* • *Sound Cards*	*(a) Types of I/O devices and ports on a standard PC for connecting I/O devices.* b) *Function of keyboard, brief principle, types, interfaces, connectors, cable.* c) *Function of Mouse, brief principle, types, interfaces, connectors, cable.* d) *Function of monitor, brief principle, resolution, size, types, interfaces, connectors, cable.* e) *Function of Speakers and Mic, brief principle, types, interfaces, connectors, cable.* f) *Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable.* g) *Precaution to be taken while connecting/removing connectors from PC ports. Method of ensuring firm connection.*
7-8	**Hardware** **Remove-Test-Replace/ Install** • Removing RAM • Installing RAM	*Types of Processors and their specifications (Intel: Celeron, P4 family, Xeon, and AMD).* a) Memory devices, types, principle of storing. Data organization 4 bit, 8 bit, word. b) Semiconductor memories, RAM,

• Removing a ROM Drive • Installing a ROM Drive • Removing a Hard Drive • Installing a Hard Drive • Defects related to SMPS, its cable, connector and servicing procedure. • Removing a Power Supply • Installing a Power Supply • Removing a Video Card • Installing a Video Card • Install Expansion Cards • Removing Fans • Installing Fans • Removing the Motherboard • Installing the Motherboard • Removing the Processor • Installing the Processor • Installing a CPU Cooler • Troubleshooting • Checking the Power Switch • Removing the CMOS Battery • Seating Expansion Cards	ROM, PROM, EMPROM, EEPROM, Static and dynamic. c) Example of memory chips, pin diagram, pin function of b) Concept of track, sector, cylinder. FD Drive components- read write head, head actuator, spindle motor, sensors, PCB. c) Precaution and care to be taken while dismantling Drives. d) Drive bay, sizes, types of drives that can be fitted. Precautions to be taken while removing drive bay from PC. f) HDD, advantages, Principle of working of Hard disk drive, cylinder and clusture, types, capacity, popular brands, standards, interface, jumper setting. Drive components- hard disk platens, and recording media, ,air filter, read write head, head actuator, spindle motor, circuit board, sensor, features like head parking, head positioning, reliability, performances, shock mounting capacity. HDD interface IDE, SCSI-I/2/3 comparative study. Latest trends in interface technology in PC and server HDD interface. g) Precautions to be taken while fitting drives into bays and bay inside PC cabinet. h) CMOS setting.(restrict to drive settings only). i) Meaning and need for using Scan disk and defrag. h) Basic blocks of SMPS, description of sample circuit.

| 9 | *Windows Installation*

A walkthrough of installing Windows 7 / 8
A walkthrough of installing Windows XP
Imaging: create a Windows system image
How to Backup/Restore your Windows partition with the bootable image disk
Duplicating a partition (creating a multiboot system)
A multiboot system: the Windows bootmanager vs. an alternative bootmanager
Setting up a multiboot/dualboot system
Dual Boot Ubuntu and Windows
Windows XP registry tweaks

Hardware Troubleshooting

• The danger in not diagnosing problems first
• Learn how to test your RAM
• Check your hard drive for errors

PC Cleaning

• The best cleaning supplies to use
• How to increase airflow and increase your computer's lifespan
• How to clean your computer | Types of software. System software-OS, Compiler. Application software-like MS office. Functions of an operating system. Disk operating system.
a) Concept of GUI, Modes of starting on different occasions.
b) Desktop, Icon, selecting, choosing, drag and drop.
c) My computer, network neighbourhood / network places.
d) Recycle bin, briefcase, task bar, start menu, tool bar, and menus.
e) Windows Explorer.
f) Properties of files and folders.
g) Executing application programs.
h) Properties of connected devices.
i) Applications under windows accessories.
j) Windows Help.
k) Finding files, folders, computers.
l) Control panel. Installed devices and properties.
Utilities for recovering data from defective/bad hard disks.
m) Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives.
n) CD ROM drives- Technology, Types of CD drives, working principle application.
o) Minor repairs and maintenance of CD ROM drives.
p) Technology, working principle, capacity, media of DVD ROM drive .
q) Important parts and functions of DVD ROM drive.
r) Minor repair works on a DVD ROM drive.
s) Technology, working principle, capacity, media of CD WRITER and use different modes of writing on a CD. Using of utility for CD writing.
t) Minor repair works on a CD WRITER.
u) Latest trends in backup devices/media. |
| 10 | *Hard Drives*

• Partitioning hard disk (primary and extended partitions)
• Hard Drive Failures
• How To Troubleshoot a Noisy Hard Drive
• How to Format a Hard Drive | • What's Inside a Hard Drive?
• How Hard Disks Work
• Inside: Hard Drive Motherboard
• Desktop Hard Drive Buyer's Guide
• What is RAID? Using Multiple Hard Drives for Performance and Reliability
• Partitioning hard disk (primary and |

	• How to Completely Erase a Hard Disk Drive	extended partitions)
		• Bad Sectors in Hard disk, Master Boot Record, in-place installation, Registry fixing, performance level check, Shortcut fixing, Fixing Startup process, log, etc.
	• How to check to see if your hard drive has bad sectors	
	• Fix the master boot record	
	• Installation and configuration of storage devices. Integration of PATA and SATA drivers.	• Learn how to prevent your PC from getting malware
	• Recover emails, files, and data from a crashed hard drive or computer	• All the different types of malware and how they attack your PC
	Virus Removal	The difference between Anti-Virus and Anti-Spyware software
	• How to run a full system scan	
	• How to fix your browser from redirecting to other websites (browser hijack)	
	• Using a modern anti-virus utility	
	• When utilities don't fix everything, how to manually remove a virus	
	• 2 specific things to disable when trying to get rid of a nasty virus	
	• 2 special utilities that work wonders	

11	**_Windows Update & Device Driver_**	Version of a software, Service pack, Updating of OS, Different configurations of Computer system and its peripherals, Compatible with different hardware/software.
	• How to find your system version in Windows, Linux • Installing a service pack • How to perform a Windows Update	Software Installation – Pre-installation - Prerequisites, Install procedure, Rollback or Un-install procedure, Tests.
	Software Installation	Post-installation – Backup procedure & specifications, Restore procedure, Periodical view check.
	• Installing a software program in windows • How to run a file from MS-DOS • Extracting or uncompressing a compressed file • How to compress or make files into one file • Extracting files from the Windows cabinets • Uninstalling Windows software • Unable to remove a program from Windows Add/Remove programs	Awareness of legal aspects of using computers such as copyright, patent etc. • What is a Driver? • What hardware device drivers should be updated • What is a Device manager?
	Installing Hardware Drivers	• Computer Maintenance Tips and Tricks to Backup, Scan and Clean
	• How To Update Drivers in Windows • How To Roll Back a Driver in Windows • Familiarization with Device manager. • Interfacing with cellphone, tablet PC, synchronization of contacts.	Power on self test, Peripheral diagnostics, general purpose diagnostics, Operating system diagnostics. Hardware boot process, Windows boot process.
	Windows Utilities	
	• How to Repair Corrupted Files Problems • How to check for corrupted files • Restore your machine back to normal • Hard disk is filling up, what should one do? • Where's the disk space ? • Top 15 Ways to Speed Up the Computer • How to Automatically Clean and Organize the Desktop, Downloads, and Other Folders • 5 Simple Rules To Keep Files Organized • 5 Reasons - Computer Is Running Slow	
12	Project Work	
13	Examination	

TRADE : *COMPUTER HARDWARE ASSISTANT*
LIST OF TOOLS AND EQUIPMENT

A.   TRAINEES TOOL KIT FOR 16 TRAINEES +1 INSTRUCTOR

Sl.No	Specification	Quantity
1	Connecting screwdriver 100 mm	21 nos.
3	Screw driver set (set of 5)	21 nos.
4	Insulated combination pliers 150 mm	21 nos.
5	Insulated side cutting pliers 150 mm	21 nos.
6	Long nose pliers 150 mm	21 nos.
7	Soldering iron 25 W. 240 V.	21 nos.
8	Electrician knife	21 nos.
9	Tweezers 100mm	21 nos.
10	Digital Multimeter	21 nos.
11	Soldering Iron Changeable bits 15 W	21 nos.
12	De- soldering pump	21 nos.

B. Tools & Equipments

Tools and Equipment: (Computer Hardware: Installation and Maintenance)		
Sl. No.	Name of the Equipment	Qty
HARDWARE		
3	Desktop Computer	20 nos
5	Intel Mobile Desktop based PC with LCD monitor	01 no
6	Printers: Laserjet, deskjet,	01 each
9	5KVA online UPS	01 no
11	LCD/DLP Projector	01 no
12	Power Meter	02 nos
14	Computer Toolkits	06 Nos.
15	Computer Spares:	As required
16	Motherboards (of different make)	4 nos
17	Cabinets	4 nos
18	Processors (of different make)	4 nos
19	Hard Disk (500 GB or better)	4 nos
20	Optical Drives	4 nos
21	LCD/LED Monitors	2 nos
22	Pen Drives	4 nos
23	External Hard disk	2 nos
24	External DVD Writer	2 nos
25	Keyboards	4 nos
26	Mouse	4 nos
27	Anti static pads	4 nos
28	Anti static wrist wraps	4 nos
29	SMPS	4 nos
30	Digital Multimeters	10 nos
31	Blu-Ray drive and player	2 nos
37	Card Reader	2 nos
38	Game video card	2 nos
39	Web Cam	2 nos

40	Headset microphone	2 nos
42	Different types of memory cards	2 nos each
47	SMPS Trainer kit	2 nos
49	Power electronics Trainer kit	2 nos
50	Post error debugging card	4 Nos
51	SMPS Tester	4 Nos.
52	PCI slot Testing tool	4 Nos.

SOFTWARE		
2	Windows Operating System	21 licenses
5	MS Office	21 nos
6	Anti virus software	21 nos
7	Data recovery software	21 nos
FURNITURE and Other Equipments		
1	Computer Tables	20 nos
2	Computer Chairs	20 nos
3	Printer Table	1 no
4	Class room chairs	20 nos
5	Air conditioners (optional)	2 nos
6	Scanner	1 no
7	Modem	1 no
8	Telephone Line	1 no
9	Broadband Internet connection	1 no
10	Fire fighting equipments	As required

Raw materials		
1	White Board Marker	1 Dozens
2	Duster Cloth(2' by 2')	20 Pcs
3	Cleaning Liquid 500 Ml	2 Bottles
4	Xerox Paper (A4)	As required
5	Full Scape Paper (White)	1 reams
6	Cartridges for printer	As required
8	Optical Mouse P/S2 or USB	As required
9	P/S2 OR USB Key Board	As required
10	SMPS	As required
11	CMOS Battery	As required
12	3 Pin Power Chord	As required

13	Cat 5/5e cable	100 meters
14	Stapler Small	2 pcs
15	Stapler Big	1 pcs
16	AAA battery for remote	As required
17	AA battery for clock	As required
18	8 GB pen drives	4 Nos
19	CDs	20 Nos
20	DVDs	10 Nos.
21	Wall Clock	1 pcs
22	Anti static pads	As required
23	Anti static wrist wraps	As required
24	Soldering wire and paste	As required
25	RJ-45 connector	As required