

Syllabus for the Trade

of

**Computer Hardware & Networking Maintenance**

**(TRADE TECHNOLOGY - I & TRADE TECHNOLOGY - II)**

Under

**CRAFT INSTRUCTOR TRAINING SCHEME (CITS)**

Re-Designed

in

– 2014 -

By

**Directorate General of Employment & Training**

**Ministry of Labour & Employment**

**Government of India**

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## **A. RATIONALE**

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess good trade skills to impart skill training. To cope up this quality possession of trade skills is imperative.

Ability to understand and interpret the course content is essential to perform a job / task of Engineering Trades. It is the skills, Knowledge and Attitude which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is imperative for any trade instructor to have skill so that same can be transferred.

For an instructor it is essential to have in depth knowledge set which enables analyzing the given job and subsequent detail planning. To transfer skill the practical know how is most important criteria as in ITI system skill is the ultimate requirement. To perform a task/job both theoretical and practical knowledge are very much needed. Thus Trade Technology is regarded as basic/hard skills which are base of all skill based training.

Recognizing this importance maximum weightage has been given to the Trade Technology in all Engineering Trades in Craft Instructors Training Scheme (CITS) under NCVT.

A good instructor should not just be aware of the contents of the syllabus of his / her trade, but also should be proficient in some extra, useful and related areas which are necessary to apply to the knowledge passed on to trainees. The instructor is also supposed to guide trainees in projects at the end of the course. For the real utility and experience he may have to put to use various areas of the subject skills, which may be not part of the curriculum but very much needed for the project. To fulfill such needs, it has been decided to add something extra apart from the contents of the CTS syllabus, taking care that the instructor trainee is not overburdened with irrelevant topics.

The three CTS courses namely IT, 'ICTSM' and 'CHNM' have been designed keeping in mind such requirement from almost all organizations, though not in bulk. A common instructor training programme for both these courses was mooted to arm the instructors of both trades with their trade related as well as extra added knowledge from the other relevant trade too. A common syllabus for these three courses will enable an Instructor to conduct training in relevant CTS trade very effectively.

## **GENERAL INFORMATION**

1. Name of the Course : Craft Instructor Training
2. Duration of Instructor Training : 1 Year (Two semesters each of six months duration).
3. Name of the Trade : **Computer Hardware & Networking Maintenance**
- 4.
5. Name of the Subject s : **TRADE TECHNOLOGY–I (Semester-a)& TRADE TECHNOLOGY-II (Semester-2)**
6. Subjects covered in the Semesters : As per syllabus detailed in Section - C
7. Examination : AITT to be held at the end of each semester.
8. Space Norms : **Class Rooms:** one each for Trade Technology - I & Trade Technology-II each of size of **30 sq. m.**  
**Workshops:** one each for Trade Technology –I & Trade Technology-II each of size of **84 sq. m.**  
  
**The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)**
9. Power Norms : **3.45 KW** for each workshop  
.
10. Unit strength(Batch Size) : **20**
11. Entry qualification : Degree in Engineering in Computer Science / IT/Electronics / NIELIT “B” or  
Three years Diploma in Computer Science / IT/Electronics or  
*NTC/NAC in IT/ICTSM/CHNM*
12. Trainers’ Qualification : Degree in Engineering in Computer Science / Information Technology/Electronics /NIELIT “B” with 2 years experience *OR*  
Three years Diploma in Computer Science / IT/Electronics with 5 years experience.  
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13. CTS trades for which :  
Corresponding CITS trades  
Trained instructor will be eligible  
to teach

**(i) Computer Hardware and Network Maintenance  
(CHNM) – 1 year**

**or**

**(ii) Information & Communication Technology System  
Maintenance (ICTSM) – 2 years**

**or**

**(iii) Information Technology (IT) - 2 years**

**Note:**

1. After passing this CITS course, a person having Degree/Diploma in Engineering or equivalent as defined in the Syllabus will be eligible to teach any of the above 3 CTS trades.
2. After passing this CITS course, the candidate with qualification NTC/NAC in the relevant CTS course is eligible to teach only the core CTS course which he studied under CTS scheme.

## **B. SEMESTER WISE ALLOTMENT OF TIME & MARKS AMONG THE SUBJECTS FOR CITS**

	SUBJECTS	Hrs./Week	% of Time Allotted	Marks	Sessional	Full Marks	Pass Marks		
							Exam.	Sessional	Total
<b>First semester</b>	Trade Practical – 1	20	50	200	30	<b>230</b>	120	18	<b>138</b>
	Trade Theory - 1	06	15	100	20	<b>120</b>	60	12	<b>72</b>
	Workshop Cal. & Sc.	06	15	50	-	<b>50</b>	30	-	<b>30</b>
	Engineering Drawing	06	15	100	-	<b>100</b>	60	-	<b>60</b>
	Library	02	05	-	-				
	<b>TOTAL</b>	<b>40</b>		<b>450</b>	<b>50</b>	<b>500</b>	<b>270</b>	<b>30</b>	<b>300</b>
<b>Second semester</b>	Trade Practical – 2	16	40	200	30	<b>230</b>	120	18	<b>138</b>
	Trade Theory - 2	04	10	100	20	<b>120</b>	60	12	<b>72</b>
	Training Methodology - Practical	12	30	200	30	<b>230</b>	120	18	<b>138</b>
	Training Methodology - Theory + IT	06+02	20	100	20	<b>120</b>	60	12	<b>72</b>
	<b>TOTAL</b>	<b>40</b>		<b>600</b>	<b>100</b>	<b>700</b>	<b>360</b>	<b>60</b>	<b>420</b>
				<b>1050</b>	<b>150</b>	<b>1200</b>	<b>630</b>	<b>90</b>	<b>720</b>

Hourly Distribution

TOTAL:1200 marks for 2 semesters

Pass marks: 720

## **C.SYLLABUS FOR THE TRADE: Computer Hardware & Networking Maintenance**

### **Trade Technology – I**

#### **Semester-1(Duration : 6 months)**

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Trade Theory			Trade Practical	
Sl. No.	Topics	Hours	Topics	Hours
1	<b>SAFETY:</b> Safety of working personal and equipment. Safety while lifting and shifting of fragile and heavy equipments. Safety precautions. Earthing, need and importance of Earthing, Types of earthing, Electrical safety. Electrical safety precautions. First aid in case of physical injury. First aid in case of Electrical hazard. Concept of e-wastage.	6	<b>SAFETY:</b> Practice of safety while lifting and shifting fragile and heavy equipments. Check earthing and identify the type of earthing. Practice electrical safety while connecting, switching-on and switching-off of heavy electrical outlet points. Practice first aid in case of physical injury. Practice first aid in case of electrical hazard. Handling e-wastage.	20
2-3	DIAC, SCR, TRIAC-principle of working, specifications, applications. Circuits and application. Differential amplifiers, OP-Amps, principle, characteristics, advantages, applications. List a few commonly used op-	12	Construct and test a Thyristor based power supply. Testing op-amp, testing and analyzing results of an OP-Amp. Wire and test a Multistage IC amplifier. Construct and test a 3-pin Voltage regulator. Construct and test an IC variable output Voltage	40

	<p>amps, Amplifiers in integrated circuit forms. IC oscillators -IC 555</p> <p>Other types of linear IC's and applications. Voltage regulator -zener diode, principle, application, limitations. Shunt and series regulators, applications, limitation. IC voltage regulators-fixed/variable, specifications, testing. Multiple output regulators, package details of some common IC regulator Comparison of linear and Switch mode power supplies. Working of SMPS. Types, specifications and applications. Circuit tracing of SMPS. Faultfinding and Troubleshooting approach of SMPS with emphasis on power supplies used in PC's and its I/O devices.</p>		<p>regulator. Trace circuit of PC SMPS. Fault finding of SMPS used in PC. Troubleshoot SMPS used in PC's. Trace circuit, Fault finding and troubleshoot Power supplies used in PC I/O devices.</p>	
4-5	<ul style="list-style-type: none"> <li>• Introduction of laptop and comparison of various Laptops.</li> <li>• Block diagram of laptop &amp; description of all its sections.</li> <li>• Study of parts of a laptop.</li> <li>• Input system: Touchpad, Trackball, Track point, Docking station, Upgrade memory, hard disk, replacing battery, Configuring wireless internet in a laptop,</li> <li>• Latest Tools &amp; Gadgets For Desktop/Laptop Repairs</li> </ul>	12	<p><b><u>Laptop PCs :</u></b></p> <ul style="list-style-type: none"> <li>• Identification of laptop sections and connectors.</li> <li>• Assembling and disassembling a Laptop.</li> <li>• Checking of various parts of a laptop.</li> <li>• Checking of batteries and adaptors.</li> <li>• Replacing different parts of laptops.</li> <li>• Upgrading RAM, HDD and other parts.</li> <li>• Testing, fault finding and troubleshooting techniques.</li> <li>• POST codes and their meaning, fixing of problems based on codes.</li> <li>• Enabling support for SATA technology. Installation of OS using SATA technology drivers.</li> </ul>	40



			<ul style="list-style-type: none"> <li>• Laptop troubleshooting</li> <li>• Latest Tools &amp; Gadgets For Desktop/Laptop Repairs</li> </ul>	
6-8	<p>a) Types of printers, Dot Matrix printers laser printer, Ink jet printer, line printer. Block diagram and function of each unit head assembly, carriage, and paper feed mechanism. Front panel controls and interfaces. Pin details of interface port.</p> <p>b) Installation of a printer driver. And self test.</p> <p>c) Ribbon types used.</p> <p>d) Refilling of ribbons.</p> <p>e) Printer cable testing defects, effect and servicing.</p> <p>f) Printer head, types, cleaning procedures.</p> <p>g) Precaution to be taken while removing and replacing printer head assembly.</p> <p>h) Pinter power supply, circuit analysis, defects, servicing.</p> <p>i) Carriage motor assembly, paper feed assembly, sensors . Procedure for dismantling and replacing mechanical parts.</p> <p>j) Printer control board, circuit, function, probable defects, servicing.</p> <p>k) Working principle of LASER printer.</p> <p>l) Toner cartridge, types, replacing toner cartridges</p> <p>m) Refilling toner cartridges, equipment available for refilling and procedure.</p> <p>n) Printer drum, function, cleaning and replacing procedure.</p> <p>o) Power supply in laser printers, circuit,</p>	18	<p><b><u>Printers &amp; Plotters</u></b></p> <p>a) Testing front panel controls. Interface pins, cables, measurement of voltages and waveforms.</p> <p>b) Installing a printer and carrying self- test.</p> <p>c) Replacing ribbon in a DMP.</p> <p>d) Refilling ribbon tape of DMP.</p> <p>e) Testing and Rectifying defective cable.</p> <p>f) Removing and cleaning printer head.</p> <p>g) Replacing a new printer head.</p> <p>h) Testing and servicing Printer power supply.</p> <p>i) Changing rollers and other mechanical parts.</p> <p>j) Tracing the control board and identifying defective components. Servicing of control board.</p> <p>k) Replacement of toner cartridge of laser printers.</p> <p>l) Refilling toner cartridge of laser printers.</p> <p>m) Drum cleaning and replacement in of laser printers.</p> <p>n) Testing and servicing Printer power supply of laser printers.</p> <p>o) Changing mechanical parts of laser printers.</p> <p>p) Tracing the control board circuit and identifying defective components. Servicing of control board of laser printers.</p> <p>q) Replacement of ink cartridge of deskjet/inkjet printers.</p> <p>r) Refilling ink cartridge of deskjet/inkjet printers.</p> <p>s) Drum cleaning and replacement in deskjet/inkjet printers..</p>	60

	<p>defects, servicing.</p> <p>p) Mechanical parts and sensors on laser printer, function, replacement procedure.</p> <p>q) Control board(s) in laser printer, circuit diagram, defects and servicing procedure.</p> <p>r) Working principle of INK JET/Deskjet printers. Type of ink used and replacement of ink cartridge.</p> <p>s) Refilling of ink, equipment available, quality of refilled cartridges.</p> <p>t) Printer drum, function, cleaning and replacing procedure.</p> <p>u) Power supply in inkjet printers, circuit, defects, servicing.</p> <p>v) Mechanical parts and sensors on inkjet printer, function.</p> <p>w) Working principle of Plotter and its common faults.</p>		<p>t) Testing and servicing Printer power supply of deskjet/inkjet printers..</p> <p>u) Changing mechanical parts of deskjet/inkjet printers..</p> <p>v) Tracing the control board and identifying defective components. Servicing of control board of deskjet/inkjet printers.</p> <p>w) Connecting and using high speed line printers.</p> <p>x) Replacing spares of line printers.</p> <p>y) Self test procedures in printers.</p> <p>Use of diagnostics software for serving printers.</p>	
9-10	<p>Working principles of Scanner, Barcode Scanner, Network Scanner.</p> <p>Working principles of Multifunction Printer, Passbook printer, High Speed Printer, Line Printer, Network Printer.</p> <p>Print Server.</p>	12	<p><b><u>Scanner &amp; MFD</u></b></p> <p>Scanner – Installtion, configuration, using Automatic Document Feeder(ADF), OCR.</p> <p>Barcode Scanner – Installation and configuration.</p> <p>Network Scanner – Installation and configuration.</p> <p>Troubleshooting of Scanner.</p> <p>Multifunction Printer – Installation, Replacing supplies and spares, troubleshooting,</p> <p>Passbook Printer – Installation, calibration, configuration &amp; troubleshooting. Replacement of Supplies and maintenance.</p> <p>Network Printer – Installation and configuration, troubleshooting.</p> <p>How to update the flash of Motherboard, printer, scanner and modem etc.</p>	40

11-12	<p>a) Types of monitor, Monochrome and colour, CGA, EGA, VGA, SVGA, Digital Analogue, interlaced non interlaced. Specifications and comparison of Monitors. Front panel controls brightness, contrast, horizontal and vertical height settings.</p> <p>b) Display cards, bus standards, types CGA, EGA VGA, SVGA, AGP , memory and drivers.</p> <p>c) Main components and connectors on display cards, display controller IC, RAM chips and dual port feature principle of working and use of display memory.</p> <p>d) Installing display drivers, setting features.</p> <p>e) Information required before changing the display driver card and precautions to be taken while installing a display driver card.</p> <p>f) LCD and TFT Monitors.</p> <p>g) Understanding the difference between flat screens and CRT display systems</p> <p>h) Understanding the displays memory and its effect on quality and performance.</p> <p>i) Working principle of LCD Projector, its specification, configuration and common faults.</p> <p>j) Working Principle of Touch Pad.</p>	12	<p><b><u>Monitor, display card and driver.</u></b></p> <p>a) Identify the type of monitor connected to PC. Specifications, front panel controls and settings.</p> <p>b) Identify the specifications of the display driver card installed in the PC.</p> <p>c) Remove the display driver card and identify the main components and connectors on the display driver card.</p> <p>d) Replace the display driver card and re-install. (before practicing this skill set, the already installed driver should be removed from device manager)</p> <p>e) Change the exiting display card with a different card given and install.</p> <p>f) Servicing of monitors, changing fuses, adjusting colors, brightness and contrast. Setting resolution, loading drivers. Checking and replacing components on the PCB. Checking and adjusting LCD Monitors.</p> <p>g) Install, configure and operate LCD Projector.</p> <p>h) Install and Configure Touch Pad.</p>	40
13-15	<p>Understand the limitation of a PC and scope for upgrading.</p> <p>Understand technical specifications for PC upgrading.</p> <p>a) Introduction to removable</p>	18	<p><b><u>Upgrading of System :-</u></b></p> <p>Mother board, Memory, CPU, Graphic Card, BIOS upgradation, Additional features, Updating of System Software &amp; Application Software (Requirement &amp; How to update)</p> <p><b><u>Practice on Back up Drives:</u></b></p>	60

	<p>storage devices, Bulk data storage devices- magnetic, optical, magneto optical drives, WORM drives.</p> <p>b) Minor repairs and maintenance of CD ROM drives.</p> <p>c) Technology, working principle, capacity, media of ZIP drives.</p> <p>d) Important parts and functions of a ZIP drive.</p> <p>e) Minor repairs and maintenance of ZIP drive.</p> <p>f) Important parts and functions of DAT drive.</p> <p>g) Minor repairs and maintenance of DAT drive.</p> <p>h) Important parts and functions of DVD ROM drive.</p> <p>i) Minor repair works on a DVD ROM drive.</p> <p>j) Minor repair works on a CD WRITER.</p> <p>k) Technology, working principle, capacity, media of Magneto- Optical Disk (MOD) drives. Applications.</p> <p>l) Important parts and functions of MOD drive.</p> <p>m) Minor repair works on MOD.</p> <p>n) Latest trends in backup devices / media.</p>		<p>Pen Drive U3 format, Zip Drive, Tape Drive, USB External Drive (HDD, CD/D VD writer), Types, capacity, interface connector, write protection, Trouble Shooting, Interface, Installation, casing for external drive.</p>	
16-18	<p>a) Safety precautions in handling PC, sub assemblies and components, Important points to be considered while purchasing and replacing components. Concept of Preventive and corrective maintenance. Tools required, Active &amp; Passive Maintenance, Maintenance</p>	18	<p><b><u>Maintenance and Troubleshooting of PC.</u></b></p> <p>a) Running diagnostics program to identify the health and defects of a PC. Check system performance using third party utilities. Use benchmarking utilities to benchmark systems.</p> <p>b) Identify the defect in PC from the audible and</p>	60

<p>scheduling. Need of diagnostics program. Features, limitations. Examples of commonly used diagnostic programs.</p> <p>b) Probable defects in PC.</p> <p>Localizing faults through its observable visual or audio symptoms and possible methods for rectification /servicing. Understanding serviceability of component. Economy in repair/replacement.</p> <p>c) Block diagram of a KB, function of controller, LED driver Sample circuit</p> <p>d) Defects related to Keyboard and its related ports(DIN,PS/2,USB) Discontinuity in cable, and bad keys. Servicing procedure.</p> <p>e) Defects related to Mouse and its related ports(COM,PS/2,USB) and servicing procedure.</p> <p>f) Working principle, electro mechanical circuits of Light pen scanner and digitizer.</p> <p>g) Defects and symptoms related to HDD and its cable, connector and servicing procedure.</p> <p>h) Defects related to CD ROM Drive jamming of mechanical assembly mal function of control circuit. and its cable, connector and servicing procedure.</p> <p>i) Defects related to Ports jumper setting on mother board and servicing procedure.</p> <p>j) Defects related to processor, its socket, cooling and servicing procedure</p> <p>k) Defects related to RAM memory module</p>	<p>observable symptoms such as beep sounds, post messages. hanged keyboard, erratic display etc., and corrective action.</p> <p>c) Tracing the circuit of a KB.</p> <p>d) Trouble shooting defects related to Keyboard and its related ports ports loose connections, replacing cable, replacing keys (DIN,PS/2,USB).</p> <p>e) Trouble shooting defects related to Mouse and its related ports loose connections, replacing cable, replacing roller and sensing elements. (COM,PS/2,USB).</p> <p>f) Study of interface cable connector, replacing of subassemblies of Light pen, scanner, digitizer</p> <p>g) Trouble shooting defects related to HDD,( practice of replacing motor, head, PCB among faulty drives) cable and connector.</p> <p>h) Trouble shooting defects related to CD ROM Drive, Attempting for replacement and adjustments) cable and connector.</p> <p>i) Trouble shooting defects related Ports to Jumper setting.</p> <p>j) Trouble shooting defects related to Processor.</p> <p>k) Trouble shooting defects related to RAM memory modules.</p> <p>l) Trouble shooting defects related BIOS.</p> <p>m) Trouble shooting defects related to CMOS setup.</p>	
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	connector and servicing procedure. l) Defects related to BIOS, upgrading and servicing procedure. m) Defects related to CMOS, COMS setup and servicing procedure. n) Defects related to battery and servicing procedure.		n) Trouble shooting defects related to Battery.	
19-20	<ul style="list-style-type: none"> <li>• Circuit Board / Motherboard Introduction.</li> <li>• Study of parts of a tablet PC / smart devices.</li> <li>• Testing of various parts with multimeter.</li> <li>• Steps of repairing various hardware problems.</li> <li>• Advanced troubleshooting techniques.</li> <li>• Introduction of various software faults.</li> <li>• Flashing of various brands of tablets / smart devices.</li> <li>• Upgrading operating systems.</li> <li>• Locking &amp; Unlocking of handsets.</li> <li>• Concept of iOS, Android, Icecream sandwich, jellybeans.</li> <li>• Concept of PhoneGap.</li> </ul>	12	<u><b>Tablet / Smart Devices</b></u> <ul style="list-style-type: none"> <li>• Assembling &amp; disassembling of different types of tablets / Smart Devices.</li> <li>• Testing of various parts with multimeter.</li> <li>• Replacing of faulty parts.</li> <li>• Fault finding &amp; troubleshooting.</li> <li>• Practice Advanced troubleshooting techniques.</li> <li>• Flashing of various brands of tablets / smart devices.</li> <li>• Upgrading operating systems.</li> <li>• Formatting of virus affected devices.</li> <li>• Unlocking of handsets through codes and software.</li> <li>• Troubleshooting settings faults.</li> <li>• Working with iOS, Android, Icecream sandwich, Jellybeans.</li> <li>• Installation of PhoneGap framework.</li> </ul>	40
21-22	<u><b>UPS</b></u> <ol style="list-style-type: none"> <li>a) Identify the specifications of UPS.</li> <li>b) Switch-on and Switch-off procedure of UPS.</li> <li>c) Measurement of Input/output voltage / current levels, battery charge level.</li> <li>d) Identifying status of UPS from front panel indicators.</li> <li>e) Carryout routine maintenance of battery , battery terminals, loose contacts etc.,</li> </ol>	12	<ol style="list-style-type: none"> <li>a) Block diagram of UPS, Principle of working of offline and on line UPS.</li> <li>b) Role of battery, specification of battery inverter and charging circuit. Procedure for switching on-off inverter/UPS.</li> <li>c) Study of typical working UPS circuit, explanation of each stage involved. Voltage, current , frequency and KVA specifications.</li> </ol>	40

	f) Test UPS as per specification. Verification of back-up time. g) Circuit tracing and fault finding practice. h) Servicing of UPS by simulating more likely faults and systematic approach to identify and rectify them.		d) Controls of different type of UPS: On-line, Off-line, Line interactive etc., Typical circuit blocks. e) Routine maintenance of battery and UPS. f) Back-up time, its dependence on battery, load and its calculations. g) Possible problems in UPS, fault finding procedures. h) Simulated faults and serving of UPS.	
23-26	Project work, Revision and Examination			

**E. List of Tools & Equipment for Trade Technology - I**  
For a batch of 20 Trainees for the trade of –  
**INFORMATION TECHNOLOGY – Hardware & Networking Maintenance**  
**Under CITS**

Sl. No.	Name of Item	Quantity (Nos.)
1.	Basic Analogue Electronics Trainer	4
2.	SMPS Trainer Kit	2
3.	Insulated Screw Driver (different types)	21
4.	Knife double bladed electrician	21
5.	Insulated handle thin connector screw driver	21
6.	Line tester	21
7.	Heavy duty screw driver	21
8.	Insulated combination pliers 150 mm	08
9.	Insulated side cutting pliers 150 mm	08
10.	Neon tester 500 V.	08
11.	Long nose plier 150 mm	21
12.	Tweezer 100mm	21
13.	Phillips type screw driver set	21
14.	Wire stripper	21
15.	Soldering iron, 20/25watts	10
16.	Soldering Iron Changeable bits 15 W	21
17.	Desoldering pump	21
18.	Digital Multimeter-hand held	21
19.	Temperature controlled soldering/ desoldering station	05
20.	Wire gauge set	04
21.	Permanent magnet bar	08
22.	Analog Multimeter	04
23.	Magneto spanner set	2 Nos.
24.	Scriber straight 150mm	2 Nos.
25.	Allen key set (set of 9)	2 Nos.
26.	Tubular box spanner (set of 6nos)	1 No
27.	0-30 V, 2 Amp, Regulated DC Power Supply	05
28.	PC Pentium IV or latest configuration (for testing with SMPS)	02
29.	Rubber gloves	08
30.	Spare Transformers and power devices required for servicing SMPS	As required
31.	Various types of Button Cells	As required

Sl. No.	Name of Item	Quantity (Nos.)
	<b>Hardware</b>	
32.	Intel Pentium IV @ 2.0 GHz or higher, 512 MB RAM or higher, Intel Motherboard, 40 GB Hard Disk or higher, 17" Monitor, Keyboard, Mouse, 52X CD ROM Drive, 1.44 MB FDD, Multimedia kit, Network Interface Card <b>or latest</b>	20 (10 nos. connected in LAN, 10 for Assy & Maint. Practice)



	<b>configuration</b>	
33.	ISDN/Broad Band Internet Connection	01
34.	20 MHz Dual Trace Oscilloscope	02
35.	Digital trainer kit	08
36.	Logic Probes/Logic Pulser	08
37.	Digital IC tester	04
38.	Function Generator	04
39.	Pulse Generator	04
40.	Digital ICs	As required
41.	Different types and makes of Motherboards	06
42.	CD Writers	04
43.	DVD writer	04
44.	External HDD	05
45.	Floppy Disk Drive	05
46.	CD ROM Drive	05
47.	Display card	05
48.	Computer monitor 15"/17" of different types	04
49.	Cabinet with SMPS	05
50.	Dot matrix printer	02
51.	Scanner	01
52.	UPS 500 VA	20
53.	Vacuum Cleaner	01
54.	Hand blower	01
55.	RAM 512 MB or higher	As required
56.	CPU different types	Do
57.	Tablet, Smart Device	02 Nos. each
58.	Printers: Laserjet, deskjet, passbook, mfd	01 each
59.	Network Printer	01 no
60.	LCD/DLP Projector with Screen	01 no
61.	Computer Toolkits	06 Nos.
62.	Computer Spares:	As required
63.	Hard Disk (500 GB or better) different types	4 nos
64.	External DVD Writer	2 nos
65.	Blu-Ray drive and player	2 nos
66.	Digital Camera	2 nos
67.	HD Display	2 nos
68.	Card Reader	2 nos
69.	Game video card	2 nos
70.	Different types of memory cards	2 nos each
71.	Laptop kits	12 nos
72.	Laptop spares: Cabinet with display, memory, hard disk, battery pack, keyboard membrane, chargers	As required
73.	UPS Trainer kit	2 nos
74.	Power electronics Trainer kit	2 nos
75.	Post error debugging card	4 Nos
76.	SMPS Tester	4 Nos.
77.	PCI slot Testing tool	4 Nos.

78.	Hardware and Network Trainer Kit	6 nos
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SOFTWARE		
79.	Data recovery software	2 nos
80.	Open source Pc Utility / Tweak Software	As available
81.	Microsoft Window 2000/ XP or latest	As required
82.	MS Office latest version	As required
83.	Anti virus latest version	As required

**Note : 1. All Software should be Network Version**

**2. Some of Course Related CBTs can be purchased (Optional)**

**NOTE-** LATEST VERSION OF HARDWARE AND SOFTWARE should be provided.

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.	PCB, solder flux etc & electronic components	As required
7.	Wires, cables Plug sockets switches of various types and other consumables	As required
8.	Resistors, Capacitors, Inductors, Diodes, LED, Transistors, Thyristors, ICs etc.	As required
9.	Spare Transformers and power devices required for servicing SMPS	As required
10.	Various types of Button Cells	As required
11.	Dry Cell	As required
12.	Hand Brush	As required
13.	Silicon grease	As required
14.	IC Puller	As required
15.	Heat sink agent	As required
16.	Cartridges for printer	As required
17.	Optical Mouse P/S2 or USB	As required
18.	P/S2 OR USB Key Board	As required
19.	CMOS Battery	As required
20.	3 Pin Power Chord	As required
21.	Cat 5/5e/6 cable	300 meters
22.	Stapler Small	2 pcs
23.	Stapler Big	1 pcs
24.	AAA battery for remote	As required
25.	AA battery for clock	As required
26.	8 GB pen drives	4 Nos
27.	CDs	20 Nos
28.	DVDs	10 Nos.

29.	Wall Clock	1 pcs
30.	Anti static pads	As required
31.	Anti static wrist wraps	As required
32.	Soldering wire and paste	As required

## **F. Furniture, Accessories and Audio Visual Aids for Trade Technology - I**

<b>Sl. No.</b>	<b>Workshop Furniture</b>	<b>Qty. (Nos.)</b>
1.	Instructor table & chair	01 each
2.	Suitable Table Teak Wood fitted with Back Panel complete with different types of meters/switches, AC/DC supplies etc. required for testing of electronic circuits. Insulation mats to cover below the table.	As required
3.	Revolving Stool cum chair	20
4.	Computer Table, Printer Table, Stools	As required
5.	Green Glass Board / White Board	01
6.	Metal Rack	As required
7.	Locker with 8 drawers (standard size) for 16 trainees	02
8.	Storage Almirah	As required
9.	Book shelf (Glass panel)	01
10.	Fire fighting equipment, first aid box etc.	As required
11.	Computer Maintenance Tables of Suitable sizes	As required
12.	Shoe Rack	As required
13.	Air conditioners (optional)	As required

**G. SYLLABUS FOR THE TRADE: Hardware & Networking Maintenance**  
**Trade Technology – II**

**Semester -2 (Duration : 6 months)**

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Trade Theory			Trade Practical	
Sl. No.	Topics	Hours	Topics	Hours
1-2	Protocols, TCP/IP, FTP, Telnet etc., Theory on Setting IP Address(IP4/IP6) & Subnet Mask, Classes of IP Addressing. Overview of Virtual LAN VLAN Memberships Identifying VLAN Trunking - VLAN Trunk Protocol ( VTP) Concept of Translator Gateways.	8	<b><u>IP Addressing &amp; TCP/IP</u></b> IP Addressing technique(IP4/IP6) and Subnetting and Supernetting the network.  Installation and Configuration of TCP/IP Protocol. Practice TCP/IP Utilities : PING, IPCONFIG, HOSTNAME, ROUTE, TRACERT etc.  Setup and configure a Virtual LAN	32
3-4	Network Components – Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point, etc. – their types, functions, advantages and applications. IP Routing in Network RIP IGRP	8	<b><u>Configuration of Data communication equipments.</u></b> Connecting computers with Network with Drop cable and using Wi Fi configuration.  Basic Programmable switch Configuration Spanning Tree Protocol ( STP ) Command Line Interface IP Routing Process Verifying Configuration	32
5-6	Collaborating using wired and wireless networks, Protecting a Network, Network performance study and enhancement.	8	<b><u>Network Protection and troubleshooting.</u></b> Setting up basic protection using public keys and MAC address filters. Integrate wired with	32

			wireless network. Power over Ethernet(PoE). Troubleshooting wired and wireless network.	
7-8	Server concepts, Server Hardware, Installation steps, configuration of server. Concept of Active Directory. ADS Overview, ADS Database, Active Directory Namespace, Logical & Physical Elements of AD.	8	<b><u>Server Installation &amp; Basic Configuration.</u></b> Identify Server Hardware Install and configure Windows Server Install and Configure Active Directory, Implementing AD Services. Configuration of broadband modem and sharing internet connection.	32
9-10	Concept of DNS. Name resolution – Host names, NetBIOS names. DNS Overview.  DHCP Overview DHCP Clients and Leases	8	<b><u>Install &amp; configure DNS</u></b> Installing and Configuring DNS Services - Setup Name resolution – Host names, NetBIOS names - Installing DNS Server - Configuring DNS Zones, DNS Clients, Delegating Zones - Testing DNS with nslookup, dnscmd and dnslint Installing and Configuring DHCP Services - DHCP Server Configuration - Setting up of DHCP, Routing and remote access.	32
11-12	Remote Access Overview VPN Concepts. Remote Access Authentication Protocol RRAS Policies IAS TCP/IP Routing Overview of Video conferencing and Netmeeting.	8	<b><u>Routing and Remote Access</u></b> - Configuring RRAS - VPN implementation - Configuring Remote Access Authentication Protocol - Configuring RRAS Policies - Configuring IAS - Managing TCP/IP Routing - Video conferencing implementation, Netmeeting.	32
13-14	Concept of User and Group.	8	<b><u>Planning and Implementing User and Group</u></b>	32

	Planning Security Group Strategy AGDLP Process Planning User Authentication Strategy Planning OU Structure Planning a Group Policy Strategy Deploying Software Through GPO		<b><u>Strategies</u></b> - Adding Account - Implement AGDLP Process - Implement User Authentication Strategy - Planning and Implementing OU Structure Planning and Maintaining Group Policies - Configuring User Environment - Configuring Computer Security	
15	Introduction to Web Server Introduction to Messaging Services Concept of Backup and Recovery of Server.	4	<b><u>Server Configuration &amp; Backup</u></b> Configure a server as web server Configuring Mailbox Servers Implementing Backup and Recovery	16
16-17	Security Baseline and Templates Audit Policy Understanding IPSec Protocol Security Planning security for Wireless Network	8	<b><u>Managing Server Network Security</u></b> - Security Baseline Settings and Templates - Configuring Audit Policy - Monitoring and Troubleshoot Network protocol - Configuring Protocol Security - Planning security for Wireless Network	32
18	Managing Network Traffic Types of Problems of Internet Connectivity Types and working of Server Services.	4	<b><u>Maintaining Network Infrastructure</u></b> - Monitor Network Traffic - Troubleshoot Internet Connectivity - Troubleshoot Server Services - Use Linux Network Tools to check / maintain / Manage Network.	16
19-20	Linux Server installation and configuration - Configuration Plan - Public and data directory - Host file - SWAT - Password Authentication - Telnet	8	<b><u>Linux Server installation and configuration</u></b> - Install Linux Server - Create new user and group - Create public and data directory - Create an lmlhosts file - Check host file - Secure and run SWAT - Filter ports	32

			- Telnet installation and configuration	
21-22	<u><b>Network Security</b></u> Modern Network Security Threats and the basics of securing a network. Secure Administrative Access, LAN security considerations. Network Security Devices. Cryptography. Wi-fi security considerations.	8	<u><b>Network Security</b></u> Practice on firewall technologies to secure the network perimeter. Practice LAN security considerations and implement endpoint and Layer 2 security features. Wi-fi configuration to implement security considerations.	32
23-26	Project work, Revision and Examination			



## H. List of Tools & Equipment for Trade Technology - II

For a batch of 20 Trainees for the trade of –

### **INFORMATION TECHNOLOGY – Hardware & Networking Maintenance** Under CITS

Sl. No.	Name of Item	Quantity (Nos.)
1.	Insulated Screw Driver (different types)	21
2.	Knife double bladed electrician	21
3.	Insulated handle thin connector screw driver	21
4.	Line tester	21
5.	Insulated combination pliers 150 mm	08
6.	Insulated side cutting pliers 150 mm	08
7.	Long nose plier 150 mm	21
8.	Tweezer 100mm	21
9.	Phillips type screw driver set	21
10.	Wire stripper	21
11.	Digital Multimeter-hand held	21
12.	Allen key set (set of 9)	2 Nos.

Sl. No.	Name of Item	Quantity (Nos.)
	<b>Hardware</b>	
13.	Intel Pentium IV @ 2.0 GHz or higher, 512 MB RAM or higher, Intel Motherboard, 40 GB Hard Disk or higher, 17" Monitor, Keyboard, Mouse, 52X CD ROM Drive, 1.44 MB FDD, Multimedia kit, Network Interface Card <b>or latest configuration</b>	20
14.	ISDN/Broad Band Internet Connection	01
15.	Network printer	01
16.	Network Scanner	01
17.	UPS 500 VA	20
18.	Vacuum Cleaner	01
19.	Hand blower	01
20.	LCD/DLP Projector with Screen	01 no
21.	Computer Toolkits	06 Nos.
22.	Computer Spares:	As required
23.	Hard Disk (500 GB or better) different types	4 nos
24.	External DVD Writer	2 nos
25.	Blu-Ray drive and player	2 nos
26.	Digital Camera	2 nos
27.	Card Reader	2 nos
28.	Hardware and Network Trainer Kit	6 nos

### **SOFTWARE**

29.	Data recovery software	2 nos
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30.	Open source Pc Utility / Tweak Software	As available
31.	Microsoft Window 2000/ XP or latest	As required
32.	MS Office latest version	As required
33.	Anti virus latest version	As required

Sl. No.	Name of Item	Quantity (Nos.)
<b>Hardware</b>		
1.	<b>Computer Server</b> Intel Pentium IV @ 3.2 GHz or higher, Intel Motherboard, 250 GB Hard Disk or higher, 1.44 MB Floppy Disk Drive, 17" Colour Monitor, MS Mouse, Keyboard, DVD ROM, 2x512 MB RAM or higher, Network Interface Card. <b>Or latest configuration.</b>	02
2.	8/16 port HUB/Switch	04
3.	1KVA online UPS	02 nos
4.	Crimping tools for network cable	21 nos
5.	Network storage	2 nos

<b>SOFTWARE</b>		
6.	Windows Server Operating System	1 license
7.	Network Management Software	01 No.
8.	LINUX Server Operating System (Samba / Su-se)	01 No.

<b>(Computer Networking)</b>		
Sl. No.	Name of the Equipment	Qty
9.	Wireless Access Point	4 nos
10.	Router	4 nos
11.	Managed Layer 2 Ethernet Switch 8/16/24 port	2 nos
12.	Managed Layer 3 Ethernet Switch 8/16/24 port	2 nos
13.	Network Training System	2 nos
14.	LAN Protocol Simulation and Analyser Software	2 nos
15.	Network and Internet security trainer	2 nos
16.	LAN cable tester	2 nos
17.	Media Convertor	4 each
18.	8/16/24 port UTP jack panel	2 nos
19.	SC Couplers	12 nos
20.	SC Pigtails	12 nos
21.	Fluke Meter	2 nos
22.	Switch with POE ports	2 nos
23.	POE adapters	2 nos
24.	Network Camera (Outdoor / Indoor)	2 no each
25.	Fibre Optics cable with LC connector	As required
26.	LC connector module	As required.

**Note : 1. All Software should be Network Version**

**2. Some of Course Related CBTs can be purchased (Optional)**

NOTE- LATEST VERSION OF HARDWARE AND SOFTWARE should be provided.

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
7.	Cat 5/5e/6 cable	300 meters
8.	Flat Cable	100 meters
9.	8 GB pen drives	4 Nos
10.	CDs	20 Nos
11.	DVDs	10 Nos.
12.	Anti static pads	As required
13.	Anti static wrist wraps	As required
14.	RJ – 45 Connector	As required
15.	Telephone cable	As required
16.	Co-axial cable	As required
17.	RJ-11 connector	As required
18.	BNC connector, T connector, terminator	As required
19.	Keystone jack	As required
20.	Patch / Jack Panel	As required
21.	Patch / Mounting cord	As required
22.	RJ-45 Info outlet with faceplate	As required
23.	RJ-45 I/O Box	As required
24.	RJ – 45 Cable extender	As required
25.	LAN Card	04 Nos.
26.	Wi-fi LAN Card both PCI and USB	02 Nos.each

## I. Furniture, Accessories And Audio Visual Aids for Trade Technology - II

Sl. No.	Workshop Furniture	Qty. (Nos.)
1.	Instructor table & chair	01 each
2.	Suitable Table Teak Wood fitted with Back Panel complete with different types of meters/switches, AC/DC supplies etc. required for testing of electronic circuits. Insulation mats to cover below the table.	As required
3.	Revolving Stool cum chair	20
4.	Computer Table, Printer Table, Stools	As required
5.	Green Glass Board / White Board	01
6.	Metal Rack	As required
7.	Locker with 8 drawers (standard size) for 16 trainees	02
8.	Storage Almirah	As required
9.	Book shelf (Glass panel)	01
10.	Fire fighting equipment, first aid box etc.	As required
11.	Computer Maintenance Tables of Suitable sizes	As required
12.	Shoe Rack	As required
13.	Air conditioners (optional)	As required

## J. LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Sh/Mr/Ms.	Organization	Mentor Council / Core Group Designation
1	Dr. Sanjeev Kumar Gupta Head, Technical Wing	National Institute of Electronics and Information Technology Electronics Niketan, 6, CGO Complex New Delhi 110 003	Chairman ,Mentor Council
2	Mr. Rajeev Menon, Sr. Director	Cognizant Technology Solutions India Pvt. Ltd. 12th & 13th Floor, "A" wing, Kensington Building Hiranandani Business Park Powai, Mumbai - 400 076 India	Member ,Mentor Council
3	Mr. Srikantan Moorthy SVP & Head - Education & Research	Infosys Electronics City, Hosur Road Bangalore 560 100	Member ,Mentor Council
4	Mr. Deepak Jain Senior VP & Global Head- Work Force Planning	WIPRO, Doddakannelli Sarjapur Road Bangalore - 560 035 India	Member, Mentor Council
5	Mr. K. Ganesan Vice President -Human Resources,	Tata Consultancy Services Ltd.,200FtThoraipakkam-Pallavaram Ring Road,Thoraipakkam,Chennai-600 096,Tamil Nadu	Member, Mentor Council
6	Saurabh Joshi,G.M.	Accenture Services Pvt. Ltd. 7th floor , tower c, building no. 8,DLF Cybercity Phase II,Gurgaon- 122002	Member ,Mentor Council
7	Mr. RaVocational InstructorShankar B.	Mindtree Ltd Global Village RCVE Post, Mysore Road Bangalore 59	Member ,Mentor Council
8	Umesh Gupta,CEO	Open Software Technology(India) Ltd.,512,PhaseV,Udyog Vihar,Gurgaon-122016	Member ,Mentor Council
9	Prof. S.C. De Sarkar	Indian Institute of Technology Bhubaneswar Bhubaneswar-751 013	Member ,Mentor Council
10	Dr. Arti Kashyup Associate Professor	Indian Institute of Technology Mandi, PWD Rest House, Near Bus Stand Mandi - 175 001, Himachal Pradesh	Member ,Mentor Council
11	Dr. B. Mahanty Professor	Indian Institute of Technology Kharagpur Kharagpur ,India - 721302	Member ,Mentor Council
12	Dr. Narayanaswamy N S Associate Professor	D/o Computer Science and Engg Indian Institute of Technology Madras, IIT P.O., Chennai -600 036	Member ,Mentor Council

13	Prof. Ashis.k. Pani, Professor	XLRI Jameshepur, Road Number 1, Circuit House Area, Sonari, Jameshepur, Jharkhand-831011	Member ,Mentor Council
14	S.K. Prasad, System Analyst	National Institute of open Schooling A-24-25, Institutional Area, Sector-62, NOIDA - 201309	Member ,Mentor Council
15	Pramod Tripathi, Senior Executive Officer	National Institute of open Schooling A-24-25, Institutional Area, Sector-62, NOIDA - 201309	Member ,Mentor Council
16	Ms. Koushalya Barik, Assistant Director(Academic)	National Institute of Open Schooling, A-24-25, Institutional Area, Sector-62 NOIDA-201309	Member ,Mentor Council
17	Naresh Chandra, JDT,	DGET,New Delhi	Mentor, Core Group
18	Dr. M. Jayprakasan, Dy. Director of Training,	ATI Chennai	Leader, Core Group
19	B.K.Singha,Dy. Director of Training,	CSTRI, Kolkata	Member, Core Group
20	N.Sundararajan,DPA Gr.B,	NIMI, Chennai	Member, Core Group
21	Valluru Babu, Dy. Director of Training	DGET,New Delhi	Member, Core Group
22	Smt. Annapurna, Training Officer	ATI ,Hyderabad	Member, Core Group
23	Sk. Altaf Hossain, Training Officer,	ATI, Howrah	Member, Core Group
24	B. Biswas , Vocational Instructor	RVTI, Kolkata	Member, Core Group
25	Sanjay Kr. Gupta, Vocational Instructor	RVTI , Vadodara	Member, Core Group
26	S.K. Acharya, Vocational Instructor	NVTI ,Noida	Member, Core Group
27	Smt P.Narmada, Vocational Instructor	RVTI, Bangalore	Member, Core Group
28	AnvarMuhmed, Vocational Instructor	RVTI, Trivandrum	Member, Core Group
29	P.T. Noushad, Assistant Training Officer,	ITI (W), Coimbatore	Member, Core Group
30	Kunal Shanti Priya, Vocational Instructor	ITI, Daltonganj, Redma, Daltonganj -822101	Member, Core Group