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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

SECTOR – IT & ITES

कौशलं बलम्
Directorate General of Training

INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE

(Engineering Trade)

(Revised in 2019)

Version: 1.2

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

During the two-year duration of Information & Communication Technology System Maintenance trade, a candidate is trained on Professional Skill, Professional Knowledge, Engineering Drawing, Workshop Calculation &Science and Employability Skill related to job role. In addition to this, a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered under Professional Skill subject are as below:-

FIRST YEAR: In this year, the trainee learns about safety and environment, use of fire extinguishers. They learns to work with various basic Electrical Components, perform all functions of Resistors and Soldering, De-soldering practice, able to recognize different types of Inductors, measure Inductance and uses of Transformer. They know about Capacitor, measure Capacitance and find resonance value of a circuit. Testing and use of Diode to construct basic Electronic components. Recognize different types of Transistors and use it as Amplifiers in electronic circuit. Construct and test of an application circuit using different types of Semiconductors. Assemble and test various Power Supply circuit. Construct all digital circuit using logic gates and verify truth table. Familiarize charging of acid battery and verify connections. Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter. Working with some important Mechanical, Electrical & Electronics Accessories used in information communication system. The candidate will be able to achieve the skill to work with Word Processing and Spreadsheet Software. Trainees are able to assemble and replace hardware components of Desktop Computer. Installation of Operating System and all other application software. Customization of Operating System and maintenance of system application software. Assemble and replace hardware components of Laptop PC. Replace/ install SMPS and troubleshoot its faults. Familiarize and upgrading various components of Motherboard. Recognize different types of memory devices, chips and its structure.

SECOND YEAR: In this year, trainee learns about installation and customization of Linux operating system. Installation of Printer, Scanner and troubleshoot their faults. Replace/ install Display Driver Card and servicing, configuration of various display unit. Replace/ install Sound Card and set properties to adjust sound quality. Maintenance and servicing of UPS. Installation and configuration of Modem, System Resources, Add on Cards, Cables & Connectors. Upgrading, maintenance and troubleshooting of PC. Assemble, replace and troubleshooting various parts of Tablet/ Smart Devices. Browsing internet and work with Cloud Computing. The candidate will be able to set up and configure Networking System using various network devices. Sharing and controlling resource and Internet connection through network. Implement Network Security to protect from various attacks on networking. Installation and basic configuration of Windows Server. Installation, configuration of DNS, Routing and user account customization. Configuration of Server and managing Server Network security and Infrastructure. Installation and basic configuration of Linux server.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

The "Information & Communication Technology System Maintenance" trade under CTS is one of the significant trade as no similar courses are available in the vocational system to cater this area. The course is of two years duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Workshop Calculation Science, Engineering Drawing and Employability Skills) impart requisite core skill, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainees broadly need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job, and repair & maintenance work.
- Check the system specification and application software as per requirement of the design of job.
- Document the technical parameters in tabulation sheet related to the task undertaken.

2.2 PROGRESSION PATHWAYS:

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programs in different types of industries leading to a National Apprenticeship certificate (NAC).

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two-year: -

S No.	Course Element	Notional Training Hours	
		1st Year	2nd Year
1	Professional Skill (Trade Practical)	1000	1000
2	Professional Knowledge (Trade Theory)	280	360
3	Workshop Calculation & Science	80	80
4	Engineering Drawing	80	80
5	Employability Skills	160	80
	Total	**1600**	**1600**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by **Controller of examinations, DGT** as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those

practices	demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

ICT Engineer; is responsible for installing and ensuring uptime of the assigned ICT node/network segment, by undertaking preventive maintenance and fault management activities. The ICT Engineer is also responsible for performing upgrades, capacity augmentation, configuration changes and Point Interconnect testing with minimal disruption of services. The ICT or Information and Communication Technology equipment are NodeB/e-NodeB, IP and TDM transmission equipment, IP and Packet Core switch, Cloud and Data Centre equipment

ICT Technician; is responsible to maintain the ICT nodes/installations live on 24x7 basis, observe and repair Level-1 faults/issues in installed ICT equipment at site, carry out specified preventive and corrective maintenance procedures and report relevant network incidents to the supervisor in time for information as well as response. ICT or Information and Communication Technology refers to NodeB/e-NodeB, IP and TDM transmission equipment, IP and Packet Core switch, Cloud and Data Centre equipment.

Computer System Hardware Analyst/Hardware Engineer; data processing requirements to plan data processing systems that provide system capabilities required for projected workloads and plans layout and installation of new system or modification of existing system. Confers with Data Processing and Project Managers to obtain information on limitations and capabilities of existing system and capabilities required for data processing projects and projected work load. Evaluates factors such as number of departments serviced by data processing equipment, reporting formats required, volume of transactions, time requirements and cost constraints, and need for security and access restrictions to determine hardware configurations. Analyses information to determine, recommend, and plan layout for type of computers and peripheral equipment, or modifications to existing equipment and system, that will provide capability for proposed project or work load, efficient operation, and effective use of allotted space. May enter data into computer terminal to store, retrieve, and manipulate data for analysis of system capabilities and requirements. May specify power supply requirements and configuration. May recommend purchase of equipment to control dust, temperature, and humidity in area of system installation. May specialize in one area of system application or in one type or make of equipment. May train users to use new or modified equipment. May monitor functioning of equipment to ensure system operates in conformance with specifications.

System Analysts; analyses user requirements, procedures, and problems to automate processing or to improve existing computer system. Confers with personnel of organizational units involved to analyse current operational procedures, identify problems, and learn specific input and output requirements, such as forms of data input, how data is to be summarised, and formats for reports. Writes detailed description of user needs, programme functions, and steps

required to develop or modify computer programme. Reviews computer system capabilities, workflow, and scheduling limitations to determine if requested programme or programme change is possible within existing system. Studies existing information processing systems to evaluate effectiveness and develops new systems to improve production or workflow as required. Prepares workflow charts and diagrams to specify in detail operations to be performed by equipment and computer programmes and operations to be performed by personnel in system. Conducts studies pertaining to development of new information systems to meet current and projected needs. Plans and prepares technical reports, memoranda, and instructional manuals as documentation of programme development. Upgrades system and corrects errors to maintain system after implementation. May assist COMPUTER PROGRAMMER in resolution of work problems related to flow charts, project specifications or programming. May prepare time and cost estimates for completing projects. May direct and co-ordinate work of others to develop, test, install, and modify programs.

Data Communication Analyst/Network Administrator; researches, tests, evaluates, and recommends data communications hardware and software: Identifies areas of operation which need upgraded equipment, such as modems, fibre optic cables and telephone wires. Conducts survey to determine user needs. Reads technical manuals and brochures to determine equipment which meets establishment requirements. Visits vendors to learn about available products or services. Tests and evaluates hardware and software to determine efficiency, reliability, and compatibility with existing system, using equipment such as computer terminal and modem. Analyses test data and recommends hardware or software for purchase. Develops and writes procedures for installation, use, and solving problems of communications hardware and software. Monitors system performance. Trains users in use of equipment. Assists users to identify and solve data communication problems. May write technical specifications to send to vendors for bid. May oversee or assist in the installation of communications hardware. May perform minor equipment repairs.

Reference NCO-2015:

a) 3114.0801 – ICT Engineer
b) 3114.0802 – ICT Technician
c) 2523.0200 –Computer System Hardware Analyst/Hardware Engineer
d) 2511.0100 – System Analysts
e) 2523.0100 –Data Communication Analyst/Network Administrator

4. GENERAL INFORMATION

Name of the Trade	**INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE**
Trade Code	DGT/1019
NCO - 2015	3114.0801, 3114.0802, 2523.0200, 2511.0100, 2523.0100
NSQF Level	Level – 5
Duration of Craftsmen Training	Two years (3200 Hours)
Entry Qualification	Passed 10th Class examination with Science and Mathematics or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, CP, LC, DW, AA, LV
Unit Strength (No. Of Student)	24(There is no separate provision of supernumerary seats)
Space Norms	70 Sq. m
Power Norms	3.45 KW
Instructors Qualification for:	
(i) Information & Communication Technology System Maintenance Trade	B.Voc/Degree in Engineering/ Technology in Computer Science/ IT/ Electronics & Communication AICTE/UGC recognized Engineering College/ university with one year expreience in the relevant field. **OR** Post Graduate in Computer Science /Computer Application/ IT/ Electronics from AICTE/UGC recognized university with one year expreience in the relevant field. **OR** Bachelor in Computer Science / Computer Application / IT OR NIELIT A Level from AICTE/UGC recognized university with two years expreience in the relevant field. **OR** 03 years Diploma in Computer Science/IT/Electronics & Communication from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years experience in the relevant field.

	OR NTC/NAC passed in the trade of "Information & Communication Technology System Maintenance" with three years experience in the relevant field. **Essential Qualification:** Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT. ***Note: - Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
(ii) Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **<u>Essential Qualification:</u>** National Craft Instructor Certificate (NCIC) in relevant trade **OR** NCIC in RoDA or any of its variants under DGT
(iii) Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the Electrical groups (Gr-II) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience.

	Essential Qualification: National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
(iv) Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) OR Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills from DGT institutes.
(v) Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

Distribution of training on hourly basis: (Indicative only)

Year	Total Hrs /week	Trade Practical	Trade Theory	Workshop Cal. & Sc.	Engg. Drawing	Employability Skills
1st	40 Hours	25 Hours	7 Hours	2 Hours	2 Hours	4 Hours
2nd	40 Hours	25 Hours	9 Hours	2 Hours	2 Hours	2 Hours

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES (TRADE SPECIFIC)

FIRST YEAR:

1. Identify various basic Electrical Components and perform measurement of current, voltage using multimeter following safety precautions.
2. Perform different functions of Resistors including Soldering, De-soldering practice.
3. Recognize different types of Inductors, measure Inductance and uses of Transformer.
4. Measure Capacitance and find resonance value of a circuit.
5. Test and use Diode to construct basic Electronic components.
6. Recognize different types of Transistors and use it as Amplifiers in electronic circuit.
7. Construct and test an application circuit using different types of Semiconductors.
8. Assemble and test various Power Supply circuit.
9. Construct all digital circuit using logic gates and verify truth table.
10. Familiarize charging of acid battery and verify connections.
11. Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter.
12. Work with some important Mechanical, Electrical & Electronics Accessories used in information communication system.
13. Perform all the functions of Word Processing and Spreadsheet Software.
14. Assemble and replace hardware components of Desktop Computer.
15. Install Operating System and all other application software.
16. Customize Operating System and maintain system application software.
17. Assemble and replace hardware components of Laptop PC.
18. Replace/ install SMPS and troubleshoot its faults.
19. Familiarize and upgrade various components of Motherboard.
20. Recognize different types of memory devices, chips and its structure.

SECOND YEAR:

21. Install and customize Linux operating system.
22. Install Printer, Scanner and troubleshoot their faults.

23. Install/Replace Display Driver Card, perform servicing and configure various display unit.
24. Install/Replace Sound Card and set properties to adjust sound quality.
25. Perform maintenance and servicing of UPS.
26. Install and configure Modem, System Resources, Add on Cards, Cables & Connectors.
27. Upgrade, maintain and troubleshoot PC.
28. Assemble, replace and troubleshoot various parts of Tablet/ Smart Devices.
29. Browse internet and work with Cloud Computing.
30. Set up and configure Networking System using various network devices.
31. Share and control resource and Internet connection through network.
32. Implement Network Security to protect from various attacks on networking.
33. Perform installation and basic configuration of Windows Server.
34. Demonstrate installation, configuration of DNS, Routing and user account customization.
35. Configure Server and manage Server Network security and Infrastructure.
36. Perform installation and basic configuration of Linux server.

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
FIRST YEAR	
1. Identify various basic Electrical Components and perform measurement of current, voltage using multimeter following safety precautions.	Construct a simple circuit using AC/ DC supply, lamp, fuse and switch.
	Measure voltage and current using Multi-meter (analog-digital).
	Measure DC and AC power using V-I method and using power meter.
2. Perform different functions of Resistors including Soldering, De-soldering practice.	Identify resistor value and tolerance using colour code.
	Measuring resistance using multimeter.
	Soldering and de-soldering techniques, practice using hook-up wires. Soldering resistors on Tag board.
	Verification of Ohms Law and Kirchhoff's Laws.
3. Recognize different types of Inductors, measure Inductance and uses of Transformer.	Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies.
	Demo on self and mutual induction.
	Rewind a transformer to given specification using winging machine.
	Identifying and testing high frequency transformers used in electronic circuits.
4. Measure Capacitance and find resonance value of a circuit.	Test working condition of capacitor. Measure capacitance using RLC meter.
	Measure capacitive reactance at different frequencies.
	Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel.
	Find the resonance frequency of a given Series and parallel resonance circuit.
5. Test and use Diode to construct basic Electronic components.	Plot forward and reverse characteristics of diode Testing working condition of diodes.
	Construct and test a half wave and full wave diode rectifiers.
	Construct a bridge rectifier with capacitance input filter.

	Draw Zener diode characteristics, Simple voltage regulator using zener diode.
6. Recognize different types of Transistors and use it as Amplifiers in electronic circuit.	Identify types of transistors based on their physical appearance. Identify the leads of the given assorted types of transistors.
	Quick test given transistors using Multimeter. Identify opens, shorted junctions.
	Wire and find the gain of amplifiers in - CB, CE, CC configurations.
7. Construct and test an application circuit using different types of Semiconductors.	Construct and test a JFET amplifier.
	Construct and test a MosFET application circuit.
	Construct and test an application circuit using SCR.
	Construct and test an application circuit using TRIAC.
8. Assemble and test various Power Supply circuit.	Assemble and test a series regulated power supply.
	Assemble and test a fixed voltage regulator using 3pin IC.
	Assemble and test a variable voltage regulator using IC.
	Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures.
9. Construct all digital circuit using logic gates and verify truth table.	Verify the truth table of two input OR, NOR, AND, NAND, NOT gates.
	Realization of different gate type using NAND gates.
	Verifying encoder/ decoder/ multiplexer/ demultplexer IC truth tables.
	Verification of Serial-in-parallel out and parallel in serial out of data.
10. Familiarize charging of acid battery and verify connections.	Familiarize with the lead acid battery, Charging of batteries, Series parallel connection of batteries.
11. Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter.	Measure of DC/AC voltages and frequency using CRO.
	Identify the internal parts of a CRO and CRT.
	Identifying AM signal. Measurement of percentage of modulation using CRO.
	Construct and test a simple Frequency modulator / transmitter. Test transmitter using FM radio.
12. Work with some important Mechanical,	Working with Gears, Belts, Stepper Motor, Drive.
	Identification and Testing of Sensors.

Electrical & Electronics Accessories used in information communication system.	Identification of different advanced Intel microprocessor chips.
13. Perform all the functions of Word Processing and Spreadsheet Software.	Creating and saving document files using Word processing software.
	Setting page and margins. Tabs and indents.
	Creating Worksheets using Spreadsheet Software.
	Using formula in cells.
14. Assemble and replace hardware components of Desktop Computer.	Removing RAM.
	Removing a ROM Drive.
	Removing a Video Card.
	Removing the Motherboard.
	Removing the Processor.
	Removing the CMOS Battery.
15. Install Operating System and all other application software.	A walkthrough of installing Windows.
	A multi-boot system: the Windows boot manager vs. an alternative boot manager.
	Installing a service pack.
	Extracting or uncompressing a compressed file.
	How To Update Drivers in Windows.
	How to Repair Corrupted Files Problems.
	How to clear web browser cache Firefox, Internet Explorer, Chrome.
	Use Ubuntu Live CD to Backup Files from Your Dead Windows Computer.
	Restore Deleted Items from an Outlook PST-file.
16. Customize Operating System and maintain system application software.	How to create automated backups to ensure you always have a recent backup.
	Check your hard drive for errors.
	How to increase airflow and increase your computer's lifespan.
	Partitioning hard disk (primary and extended partitions).
	How to run a full system scan.
	Using Task manager and Event Viewer.
	Changing the storage location of installed software.

17. Assemble and replace hardware components of Laptop PC.	Assembling and disassembling a Laptop.
	Replacing different parts of laptops.
	Upgrading RAM, HDD and other parts.
	Testing, fault finding and troubleshooting techniques.
	POST codes and their meaning, fixing of problems based on codes.
	Enabling support for SATA technology. Installation of OS using SATA technology drivers.
18. Replace/ install SMPS and troubleshoot its faults.	Remove the SMPS from PC cabinet. Identify the types of output connectors of SMPS.
	Open and cleaning the cooling fan and other parts.
	Fix the SMPS inside the PC cabinet and test PC.
	Use of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool.
19. Familiarize and upgrade various components of Motherboard.	Remove the mother board from PC cabinet. Identify the main components on the motherboard.
	Identify the chipset used.
	Identify the type of processor connector (slot/ socket/ dual).
	Identify the connector for COM1, Com2.
	Replace the weak/ dead battery on the mother board.
	Replacing/ upgrading Processor.
20. Recognize different types of memory devices, chips and its structure.	Identification of different types of memory devices.
	Identification of SIMM and DIMM memory modules, number of pins, type.
SECOND YEAR	
21. Install and customize Linux operating system.	Installing UNIX/ LINUX.
	Adding new users, software, material components.
	Making back-up copies of the index and files.
22. Install Printer, Scanner and troubleshoot their faults.	Installing a printer and carrying self- test.
	Refilling ribbon tape of DMP.
	Removing and cleaning printer head.
	Tracing the control board and identifying defective components. Servicing of control board.
	Scanner - Installation, configuration, using Automatic Document Feeder (ADF), OCR.

	Network Scanner - Installation and configuration.
	Troubleshooting of Scanner.
	Multifunction Printer - Installation, Replacing supplies and spares, troubleshooting.
23. Install/Replace Display Driver Card, perform servicing and configure various display unit.	Remove the display driver card and identify the main components and connectors on the display driver card.
	Change the exiting display card with a different card given and install.
	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.
	Install, configure and operate LCD Projector.
24. Install/Replace Sound Card and set properties to adjust sound quality.	Identify the specifications of the installed sound card in the PC.
	Remove the sound card from PC and identify the main components on the card.
	Change the existing sound card with a different card given and install.
	Connect the speaker and microphone, adjust the controls for better quality sound and testing.
25. Perform maintenance and servicing of UPS.	Identify the specifications of UPS.
	Measurement of Input/ output voltage/ current levels, battery charge level.
	Test UPS as per specification. Verification of back-up time.
	Servicing of UPS by simulating more likely faults and systematic approach to identify and rectify them.
26. Install and configure Modem, System Resources, Add on Cards, Cables & Connectors.	Installation and configuration of different types of Modem e.g. DSL, ADSL, Data Card, Dongle etc.
	Practice on setting IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play.
	AGP, PCI Express, TV Tuner Card, DVR card, Video Capture, SCSI. USB, NIC, Fire wire, Card reader, network storage, Game video card, Camera etc.
27. Upgrade, maintain and troubleshoot PC .	Rectify the windows start-up problem by reinsertion or replacement.
	Rectify the virus protection utility problem by reinsertion or replacement.
	Mother board, Memory, CPU, Graphic Card, BIOS up-gradation, Additional features, Updating of System Software & Application Software

	(Requirement & How to update).
	Pen Drive U3 format, Zip Drive, Tape Drive, USB External Drive (HDD, CD/ DVD writer), Types, capacity, interface connector, write protection, Troubleshooting, Interface, Installation, casing for external drive.
	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.
	Troubleshooting defects related to Keyboard and its related ports loose connections, replacing cable, replacing keys (DIN, PS/2, USB).
	Troubleshooting defects related to HDD, (practice of replacing motor, head, PCB among faulty drives) cable and connector.
	Troubleshooting defects related to RAM memory modules.
28. Assemble, replace and troubleshoot various parts of Tablet/ Smart Devices.	Assembling & disassembling of different types of tablets/ Smart Devices.
	Replacing of faulty parts.
	Practice Advanced troubleshooting techniques.
	Upgrading operating systems.
29. Browse internet and work with Cloud Computing.	Practice web browsing using popular web browsing software, Configuring web browser.
	Sending document/ softcopy by email, activating spell checking, using address book, Handling SPAM, Removal of Cookies.
	Work with Cloud services.
30. Set up and configure Networking System using various network devices.	Familiarization with various Network devices, Connectors and Cables.
	Crimping practice with straight and cross CAT 5 cables.
	Punching practice in IO Box and patch panel.
	Create cabling in a lab with HUB/ Switch and IO Boxes and patch panel.
	Installing & Configuring a Peer-to-Peer Network using Windows Software.
	Connecting computers with Network with Drop cable and using Wi-Fi configuration.
	Basic Programmable switch Configuration Spanning Tree Protocol (STP).
	Installation and Configuration of TCP/ IP Protocol.
	Setup and configure a Virtual LAN.
	Practice on configuring DHCP.
31. Share and control resource and Internet	Sharing Resource and Advance Sharing Setting.
	Exposure and using Internet. Setting E-mail accounts. Conferencing.

connection through network.	Setting up of basic collaboration tool like NetMeeting for activities like chat, application sharing, remote desktop access and control, VoIP.
32. Implement Network Security to protect from various attacks on networking.	Setting up basic protection using public keys and MAC address filters.
	Troubleshooting wired and wireless network.
	Practice on firewall technologies to secure the network perimeter.
	Wi-Fi configuration to implement security considerations.
33. Perform installation and basic configuration of Windows Server.	Install and configure Windows Server.
	Install and Configure Active Directory.
	Implementing AD Services.
34. Demonstrate installation, configuration of DNS, Routing and user account customization.	Installing and Configuring DNS Services Setup Name resolution – Host names, NetBIOS names. Installing DNS Server.
	Installing and Configuring DHCP Services DHCP Server Configuration. Setting up of DHCP, Routing and remote access.
	Configuring Remote Access Authentication Protocol.
	Managing TCP/ IP Routing.
	Implement AGDLP Process.
	Planning and Maintaining Group Policies - Configuring User Environment.
35. Configure Server and manage Server Network security and Infrastructure.	Configure a server as web server.
	Implementing Backup and Recovery.
	Security Baseline Settings and Templates.
	Configuring Protocol Security.
	Monitor Network Traffic.
	Troubleshoot Server Services.
36. Perform installation and basic configuration of Linux server.	Install Linux Server.
	Create public and data directory.
	Telnet installation and configuration.

SYLLABUS FOR INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Identify various basic Electrical Components and perform measurement of current, voltage using multimeter following safety precautions.	**Familiarization with the Institute and Safety** 1. Visits to workshops, labs, office, stores etc., of the institute. (5 hrs) 2. Demonstration of safety precaution. (5 hrs) 3. Demo of first aid practice. (5 hrs) 4. Demo of artificial respiration and practice. (5 hrs) 5. Demo of electrical safety precautions. (5 hrs)	• Punctuality and Discipline expected of trainees. Course duration, methodology and structure of the training program. • About the institute and infrastructure. • Safety in moving and shifting heavy and delicate equipments. • First aid. • Artificial respiration. • Electrical safety.(07 hrs.)
		Basic concepts of Electricity 6. Identify specification of types of fuses. Identification and specification of type of switches. (3 hrs) 7. Identification of meter types and measuring range. (3 hrs) 8. Construct a simple circuit using AC/ DC supply, lamp, fuse and switch. (4 hrs) 9. Measure circuit voltage and current using voltmeters and ammeters. (3 hrs) 10. Measure voltage and current using Multi-meter (analog-digital). (4 hrs) 11. Use Multimeter to check fuses,	• 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. • Circuit voltage and current. Measuring circuit voltage and current using voltmeters and ammeters. AC and DC meters. • Measuring instruments, MC, MI type, Ammeter, Voltmeter, Multimeter for measuring voltage and current.

		lamps and switches. (4 hrs) 12. Measure DC and AC power using V-I method and using power meter. (4 hrs)	Construction, characteristics/ features and specification. Digital Multimeter. • Meaning of Circuit and basic electrical circuits. • Meaning of resistance, continuity and continuity testers. Multimeter for checking continuity. • Concept of Power and measurement using V&I meter and Power meter. (07 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Perform different functions of Resistors including Soldering, De-soldering practice.	**Resistors. Soldering and De-soldering** 13. Identify different types of resistors from physical appearance. (4 hrs) 14. Identify resistor value and tolerance using colour code. (4 hrs) 15. Measuring resistance using Multimeter. (4 hrs) 16. Soldering and de-soldering techniques, practice using hook-up wires. Soldering resistors on Tag board. (4 hrs) 17. Verification of Ohms Law and Kirchhoff's Laws. (5 hrs) 18. Soldering resistors on PCB. (5 hrs) 19. De-soldering practice. (5 hrs) 20. Experiment using P.T.C and NTC resistors. (5 hrs) 21. Experiment to check VDR's. (5 hrs) 22. Experiment to check LDR's. (5 hrs) 23. Test Pots, Presets. (4 hrs)	• Classification, characteristics and application of different types of resistors.-carbon film, metal film, wire wound, cermets and surface mounted. • Colour coding of resistors. Calculating Imeasuring resistance value and its tolerance value. Wattage of resistors, specific resistance and their importance. • Resistors in series and parallel. • Soft soldering and precautions to be taken for making a good solder joint. Types of solder and need of soldering paste. • Ohms law and Kirchhoff's Laws. • Printed circuit boards and its application. • De-soldering tools. • Temperature dependent resistors and their applications.(PTC and NTC) . • Voltage dependent resistors (VDR). • Photoelectric effect, Light

			Dependent resistors. • Variable resistors, pots, presets, types and application. Log and Linear resistors. (14 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Recognize different types of Inductors, measure Inductance and uses of Transformer.	**Inductance** 24. Identification of different types of inductors and its specifications. (5 hrs) 25. Measure inductance using LCR meter.Calculate inductive reactance at different input signal frequencies. (8 hrs) 26. Demo on self and mutual induction. (7 hrs) 27. Check step down transformers. (8 hrs) 28. Rewind a transformer to given specification using winging machine. (7 hrs) 29. Finding losses and efficiency of given transformers. (8 hrs) 30. Identifying and testing high frequency transformers used in electronic circuits. (7 hrs)	• Definition of inductance. Properties. Types of inductors and their application. • Inductive reactance, measuring inductance and inductive reactance. Meaning of lead, lag. Effect of inductor on power factor. Frequency dependence of inductive reactance. • Self and Mutual inductance. Coefficient of coupling. • Transformers. Turns ratio. Transformer winding. Winding machines. • Transformer losses and efficiency. • Uses, losses, efficiency type of cores and uses for LF, HF, VHF transformer. • Transformers used in high frequency applications. (14 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Measure Capacitance and find resonance value of a circuit.	**Capacitance and Resonance circuits** 31. Identify of different types of capacitors from colour code and typographic code. (5 hrs) 32. Test working condition of capacitor. Measure capacitance using RLC meter. (8 hrs) 33. Measure capacitive reactance at different frequencies. (12 hrs) 34. Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel. (12 hrs) 35. Find the resonance frequency of	• 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. • Measuring capacitance and capacitive reactance. • Behaviour of capacitance at different frequencies. • Capacitors in series and parallel.

		a given Series and parallel resonance circuit. (13 hrs)	• Meaning of Resonance. Application of resonance. Series and parallel resonance circuits. (07 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Test and use Diode to construct basic Electronic components.	**Electronic Components** 36. Identify terminals of different types of diodes. Record its specifications referring to diode data sheet. (5 hrs) 37. Plot forward and reverse characteristics of diode Testing working condition of diodes. (7 hrs) 38. Construct and test a half wave and full wave diode rectifiers. (9 hrs) 39. Construct and test a Bridge rectifier with and without filter. (9 hrs) 40. Construct a bridge rectifier with capacitance input filter. (10 hrs) 41. Draw Zener diode characteristics, Simple voltage regulator using zener diode. (10 hrs)	• Semiconductor, intrinsic and extrinsic semi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown voltage. • Different types of Diodes. Diode terminals. Diode specifications using data book. • Forward and reverse characteristics of diode. Testing diodes using Multimeter. • Half wave and Full wave rectifiers using diodes. Transformer requirements. Calculating output DC, ripple factor. • Bridge rectifier. Calculating output DC, ripple factor. • Filters for rectifiers. Calculating output DC, ripple factor. • Zener diode-Its characteristics and application for voltage regulation. Calculating the series resistor for required current rating. • Specifications of a regulated power supply and testing a power supply for its specifications. (14 hrs.)
Professional Skill 50Hrs;	Recognize different types of Transistors and use it as	**Transistor and Amplifiers** 42. Identify types of transistors based on their physical	• Working principle of PNP, Bipolar transistors. Types of transistors and applications.

Professional Knowledge 14 Hrs	Amplifiers in electronic circuit.	appearance. Identify the leads of the given assorted types of transistors. (15 hrs) 43. Quick test given transistors using Multimeter. Identify opens, shorted junctions. (15 hrs) 44. Wire and find the gain of amplifiers in - CB, CE, CC configurations. (20 hrs)	Leads of transistors and their identification. • Forward and reverse bias of transistor Junction. General values of junction resistances. Quick testing a transistor-using Multimeter. • 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. (14 hrs.)
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Construct and test of an application circuit using different types of Semiconductors.	**Special Semiconductors- FET** 45. Construct and test a JFET amplifier. (02 hrs) 46. Construct and test a MosFET application circuit. (03hrs) 47. Construct and test a relaxation oscillator using UJT. (05hrs) 48. Construct and test an application circuit using SCR. (05hrs) 49. Construct and test an application circuit using DIAC. (05hrs) 50. Construct and test an application circuit using TRIAC. (05hrs)	• Field effect transistors, types, working principle, applications. • Working principle and application of UJT. • Working principle and application of SCR. • Working principle and application of TRIAC. • Working principle and application of DIAC.(07 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14Hrs	Assemble and test various Power Supply circuit.	**Power supply** 51. Practice on identifying and using the controls on a regulated power supply. (5 hrs) 52. Assemble and test a series regulated power supply. (7 hrs)	• Unregulated, regulated DC Power supply specifications. Application of different types of power supply for specific application types. • Series regulator using transistor.

		53. Assemble and test a shunt regulated power supply. (7 hrs) 54. Assemble and test a fixed voltage regulator using 3pin IC. (7 hrs) 55. Assemble and test a variable voltage regulator using IC. (8 hrs) 56. Assemble a simple inverter and converter for use with emergency lamp. (8 hrs) 57. Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures. (8 hrs)	Short circuit protection. Overload protection. • Shunt regulators using transistors. • Fixed Voltage regulators using IC's. • Variable voltage regulators using IC's. • Mains voltage stabilizers. • Inverters and converters. • Un-interrupted power supply, types and applications. (14 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Construct all digital circuit using logic gates and verify truth table.	**Digital Electronics** 58. Identify the specifications of given digital IC's referring to data books. (2 hrs) 59. Verify the truth table of two input OR, NOR, AND, NAND, NOT gates. (3 hrs) 60. Verify of truth table of multiple input logic gates. (3 hrs) 61. Verify the truth table of XOR and XNOR Gates. (3 hrs) 62. Realization of different gate type using NAND gates. (3 hrs) 63. Verification of Boolean laws. (3 hrs) 64. Realization of half adder & full adder using NAND gates. Realization half subtractor and full subtractor using NAND gates. (3 hrs) 65. Verification of truth table of 7483- 4bit adder. (3 hrs) 66. Verifying encoder/ decoder/ multiplexer/ demultplexer IC truth tables. (3 hrs)	• Number systems and conversions. Classification of digital IC's. Use of data book for identification of digital IC's. • Basic LOGIC GATES and truth table. Boolean algebra. • Logic families, logic levels, propagation delay. Multiple input gates. • XOR, XNOR gates and application. • Simplification of Boolean equations. • Combinational logic circuits. g) Half adder, full adder, parallel binary adder, half subtractor, fullsubtractor. • Commercially available adders/ subtractors. • Comparator, decoders, encoders, multiplexer, demultiplexer. • Parity generators / checkers. RS Flip - Flop, JK flip-flop, Master-Slave flip-flops.

		67. Realization and verification of truth table of RS, JK and MS- JK flip-flop. (3 hrs) 68. Realization and verification of D-flip flop. (3 hrs) 69. Realization and verification of up & down (sync/async) counter. (3 hrs) 70. Verification of A/D & D/A converter. (3 hrs) 71. Realization of shift registers using FF. (3 hrs) 72. Verification of Right-shift, Left-shift registers. (3 hrs) 73. Verification of Serial-in-parallel out and parallel in serial out of data. (3 hrs) 74. Representation of logic function's truth table using K-Map. (3 hrs)	• Types of triggering and applications. D flip-flops. • Counters, ripple, synchronous, up-down, scale-n counters. • Principles of A/D & D/A converter. Commercially available A/D & D/A converters. Applications. • Shift registers. Types, applications. • Commercially available shift registers and applications. • Conversion of serial data into parallel and vice-versa. • Concept of Karnaugh Map (K-Map). (14 hrs.)
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Familiarize charging of acid battery and verify connections.	**Battery** 75. Familiarize with the lead acid battery, Charging of batteries, Series parallel connection of batteries. (25 hrs)	• Lead acid cell, its construction and chemical changes during charging and discharging. Battery charging methods. Maintenance free batteries. Lithium cell, Ni-cad cells their construction and applications. (07 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Verify internal parts of CRO and use it to measure voltage, frequency, modulation of modulator/ transmitter.	**Oscilloscope** 76. Identify CRO front panel controls. (6 hrs) 77. Measure of DC/AC voltages and frequency using CRO. (6 hrs) 78. Identify the internal parts of a CRO and CRT. (6 hrs) 79. Calibrate a given CRO. (7 hrs)	• Working principle and application. • Precautions to be taken while measuring voltages using CRO. • Internal parts of a CRO. Construction and function of CRT and its associated circuitry. • Simple Calibration procedures care and maintenance. (07 hrs.)

	Latest trends in interface

			• Applications under windows accessories. • Windows Help. • Finding files, folders, computers. • Control panel. Installed devices and properties. (07 hrs.)
Professional Skill 75Hrs; Professional Knowledge 21 Hrs	Customize Operating System and maintain system application software.	**Data Backup** 159. 3 types of media to use when backing up your data, and when each method is appropriate. (2 hrs) 160. How to create automated backups to ensure you always have a recent backup. (2 hrs) 161. Learn how to manually backup data. (2 hrs) 162. How to make an exact copy (clone) of a hard drive. (2 hrs) **Hardware Troubleshooting** 163. The danger in not diagnosing problems first. (3 hrs) 164. Learn how to test your RAM. (4 hrs) 165. Check your hard drive for errors. (4 hrs) **PC Cleaning** 166. The best cleaning supplies to use. (2 hrs) 167. How to increase airflow and increase your computer's lifespan. (2 hrs) 168. How to clean your computer. (2 hrs)	• Utilities for recovering data from defective/bad hard disks. • Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives. • CD ROM drives- Technology, Types of CD drives, working principle application. • Technology, working principle, capacity, media of DAT Drive and back-up procedures. • Technology, working principle, capacity, media of DVD ROM drive. • Technology, working principle, capacity, media of CD WRITER and use different modes of writing on a CD. Using of utility for CD writing. (07 hrs.)
		Hard Drives 169. Partitioning hard disk (primary and extended partitions). (2 hrs) 170. Hard Drive Failures. (2 hrs)	• What's Inside a Hard Drive? • How Hard Disks Work. • Inside: Hard Drive Motherboard. • Desktop Hard Drive Buyer's

		171. How To Troubleshoot a Noisy Hard Drive.(2 hrs) 172. How to Format a Hard Drive. (2 hrs) 173. How to Completely Erase a Hard Disk Drive. (2 hrs) 174. Installation and configuration of storage devices. Integration of PATA and SATA drivers. (3 hrs) 175. Recover emails, files, and data from a crashed hard drive or computer. (2 hrs) **Virus Removal** 176. How to run a full system scan. (1 hr) 177. How to fix your browser from redirecting to other websites (browser hijack). (1 hr) 178. Using a modern anti-virus utility. (2 hrs) 179. When utilities don't fix everything, how to manually remove a virus. (2 hrs) 180. 2 specific things to disable when trying to get rid of a nasty virus. (2 hrs) 181. 2 special utilities that work wonders. (2 hrs)	Guide. • What is RAID? Using Multiple Hard Drives for Performance and Reliability. • Partitioning hard disk (primary and extended partitions). • Learn how to prevent your PC from getting malware. • All the different types of malware and how they attack your PC. • The difference between Anti-Virus and Anti-Spyware software. (07 hrs.)
		System Utilities 182. How to check to see if your hard drive has bad sectors. (1 hr) 183. Fix the master boot record. (2 hrs) 184. How to run an in-place installation. (1 hr) 185. Using Task manager and Event Viewer. (2 hrs)	• Bad Sectors in Hard disk, Master Boot Record, in-place installation, Registry fixing, performance level check, Shortcut fixing, Fixing Startup process, log, etc. • Users and user account. Privileges, scope, permissions etc. • Concept of Virtual Machine.

		186. Using System Monitor and Performance Logs. (2 hrs) 187. Configure config.sys file. (2 hrs) **User Account Customization** 188. How to create and configure user accounts in Windows XP, Vista, 7/8. (2 hrs) 189. Make Changes to an Account. (2 hrs) 190. Changing the storage location of the personal folders. (1 hr) 191. Changing the storage location of installed software. (1 hr) 192. Setting up Parental Controls in Windows XP,Vista,7, 8. (2 hrs) 193. How to Use Fast User Switching in Windows. (2 hrs) 194. View Hidden Files and Folders. (1 hr) 195. Lock Down Windows 7 / 8 With User Account Control. (2 hrs) 196. How to Delete User Accounts in Windows. (2 hrs)	(07 hrs.)
Professional Skill 75Hrs; Professional Knowledge 21 Hrs	Install Operating System and all other application software.	**Windows Update & Device Driver** 197. How to find your system version in Windows, Linux. (2 hrs) 198. Installing a service pack. (3 hrs) 199. How to perform a Windows Update. (2 hrs) **Software Installation** 200. Installing a software program in windows. (3 hrs) 201. How to run a file from MS-DOS. (3 hrs) 202. Extracting or uncompressing a compressed file. (2 hrs) 203. How to compress or make files into one file. (2 hrs)	• Version of a software, Service pack, Updating of OS, Different configurations of Computer system and its peripherals, Compatible with different hardware/ software. Software Installation – • Pre-installation –Prerequisites, Install procedure, Rollback or Un-install procedure, Tests. • Post-installation – Backup procedure & specifications, Restore procedure, Periodical view check.

		204. Extracting files from the Windows cabinets. (2 hrs) 205. Uninstalling Windows software. (3 hrs) 206. Unable to remove a program from Windows Add/ Remove programs. (3 hrs)	• Awareness of legal aspects of using computers such as copyright, patent etc. (07 hrs.)
		Installing Hardware Drivers 207. How To Update Drivers in Windows.(1 hr) 208. How To Roll Back a Driver in Windows. (2 hrs) 209. Familiarization with Device manager. (2 hrs) 210. Interfacing with cellphone, tablet PC, synchronization of contacts. (2 hrs) **Windows Utilities** 211. How to Repair Corrupted Files Problems. (2 hrs) 212. How to check for corrupted files. (2 hrs) 213. Restore your machine back to normal. (2 hrs) 214. Hard disk is filling up, what should one do? (2 hrs) 215. Where's the disk space? (2 hrs) 216. Top 15 Ways to Speed Up the Computer. (2 hrs) 217. How to Automatically Clean and Organize the Desktop, Downloads, and Other Folders. (2 hrs) 218. 5 Simple Rules To Keep Files Organized. (2 hrs) 219. 5 Reasons - Computer Is Running Slow. (2 hrs)	• What is a Driver? • What hardware device drivers should be updated? • What is a Device manager? • Computer Maintenance Tips and Tricks to Backup, Scan and Clean. • Power on self test, Peripheral diagnostics, general purpose diagnostics, Operating system diagnostics. • Hardware boot process, Windows boot process. (07 hrs.)
		Junk File Removal 220. How to Remove Junk Files. (1	• Junk files, deleted files, configuration of internet

		hr) 221. How to completely remove "deleted" files. (1 hr) 222. How to clear web browser cache Firefox, Internet Explorer, Chrome. (1 hr) 223. 5 steps to clean up your computer files. (1 hr) 224. Personalize your Windows XP-based PC. (1 hr) **Linux OS** 225. Using a Linux Live CD. (4 hrs) 226. Why you want a Linux Live CD. (4 hrs) 227. Use Ubuntu Live CD to Backup Files from Your Dead Windows Computer. (4 hrs) 228. Using a live CD as your Linux Desktop. (4 hrs) **Outlook Configure & Backup** 229. Configure outlook. (1 hr) 230. Backup and Restore Outlook. (1 hr) 231. How to restore the Outlook default installation, toolbars and settings. (1 hr) 232. Restore Deleted Items from an Outlook PST-file. (1 hr)	browser. • Introduction to UNIX/LINUX and its structure. • Files and Processes in Linux. • Directory structure of Linux O.S. • Outlook - Add and use contacts, Calendar basics, Recall and replace sent messages, Send automatic replies when you're out of the office, The ins and outs of BCC, Use Instant Search to find Calendar items, Use Instant Search to find contacts, Use Instant Search to find messages and text, Add holidays to your calendar, Create or delete a search folder, Import and export vCards to Outlook contacts, Make the switch to Outlook 2013, Reach out with contact groups (distribution lists), Send or delete an email stuck in your outbox, Take calendars to the next level, Track email with read receipts, Password protect your mailbox, Use rules to manage your email. (07 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Assemble and replace hardware components of Laptop PC.	**Laptop PCs** 233. Identification of laptop sections and connectors. (03 hrs) 234. Assembling and disassembling a Laptop. (08 hrs) 235. Checking of various parts of a laptop. (03 hrs) 236. Checking of batteries and adaptors. (02 hrs)	• Introduction of laptop and comparison of various Laptops. • Block diagram of laptop & description of all its sections. • Study of parts of a laptop. • Input system: Touchpad, Trackball, Track point, Docking station, Upgrade memory, hard disk, replacing battery,

		237. Replacing different parts of laptops. (8 hrs) 238. Upgrading RAM, HDD and other parts. (05 hrs) 239. Testing, fault finding and troubleshooting techniques. (05 hrs) 240. POST codes and their meaning, fixing of problems based on codes. (05 hrs) 241. Enabling support for SATA technology. Installation of OS using SATA technology drivers. (05 hrs) 242. Laptop troubleshooting. (03 hrs) 243. Latest Tools & Gadgets For Desktop/ Laptop Repairs. (03 hrs)	Configuring wireless internet in a laptop. • Latest Tools & Gadgets For Desktop/ Laptop Repairs. (14 hrs.)
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Replace/ install SMPS and troubleshoot its faults.	**SMPS** 244. Remove the SMPS from PC cabinet. Identify the types of output connectors of SMPS. (05 hrs) 245. Identify output voltages using colour coding. Measure voltage levels. Test power cable and fuse. (05 hrs) 246. Open and cleaning the cooling fan and other parts. (05 hrs) 247. Fix the SMPS inside the PC cabinet and test PC. (05 hrs) 248. Use of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool. (05 hrs)	• DC power source to PC. Need for SMPS. Specifications. Rating of SMPS based on type of motherboard and devices used. (AT/ ATX, Micro ATX, mini ATX). • Color coding adopted. Types of connectors used. Output voltage levels. Measuring technique. • Precautions to be taken while cleaning the internal area of SMPS. • Precautions to be taken while fixing the SMPS inside the cabinet. (07 hrs.)
Professional Skill 50Hrs; Professional	Familiarize and upgrade various components of Motherboard.	**Motherboard/ System board** 249. Remove the mother board from PC cabinet. Identify the main components on the	• Mother board function, types, Main components on the mother board and their interconnection. Functional

Knowledge 14 Hrs		motherboard. (3 hrs) 250. Identify the form factor of the mother board. (2 hrs) 251. Identify the chipset used. (2 hrs) 252. Identify the number of slots available for add-in cards (ISA, PCI, AGP). (2 hrs) 253. Identify the type of processor connector (slot/ socket/ dual). (2 hrs) 254. Identify the BIOSROM, make, version. (3 hrs) 255. Identify the jumper settings (if any) on the mother board. (2 hrs) 256. Identify the types of slots available for memory modules. (3 hrs) 257. Identify the connectors for Hard disk (IDE). (3 hrs) 258. Identify the connector for FDD. (2 hrs) 259. Identify the connector for COM1, Com2. (3 hrs) 260. Identify the connectors for PS/2. (3 hrs) 261. Identify the connectors for USB. (3 hrs) 262. Identify the connectors for Game port. (3 hrs) 263. Identify the connector for parallel port (Centronics). (3 hrs) 264. Identify the connector for Keyboard (in exclusively available). (3 hrs) 265. Identify the specifications of the Lithium battery. (3 hrs)	description of mother board, Specification and variation. Precautions to be taken before removing the mother board from PC cabinet. • Form factor of mother board. • Meaning and function of chips sets. Manufacturers, comparison, importance of quality chip set for performance of PC. • Bus standards-evolution, speed, latest trends (ISA, PCI, AGP, new trends). • Types of processor connectors, examples of latest processor connectors, number of pins. f) Function of BIOS, manufacturers of BIOS. • IDE ports available .Primary, secondary. Number of drives that can be connected. Methods of adding SCSI drives. • Details of FDD connector on mother board. • Facility for serial Communication ports on mother board. • Facility for PS/2 Communication ports on mother board. • Meaning and advantage of USB ports. Facility for USB Communication ports on mother board. • Facility for game ports on mother board. • Facility for parallel Communication port on mother

		266. Identify any other special component available on the mother board. (3 hrs) 267. Identify the connectors for front panel switches and display. (2 hrs)	board. • Type of connectors in which keyboards cab be used, old type full size DIN connector. • Need of Lithium battery. Its specifications. Replacement procedure. Effect of removing the battery from mother board. • Other special components available on mother boards such as integrated devices/ drivers.(14 hrs.)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Recognize different types of memory devices, chips and its structure.	**Possible upgrading/ changing components on the mother board** 268. Replace the weak/ dead battery on the mother board. (5 hrs) 269. Replace/ upgrade RAM memory modules. (5 hrs) 270. Replacing/ upgrading Processor. (5 hrs) 271. Carryout Jumper setting on mother board. (5 hrs) 272. Changing CMOS set-up and setting system level password. (5 hrs)	• Effect of weak/ dead battery on PC performance. Identifying weak/ dead battery. Precautions to be taken before replacing the battery. Setting to be done after replacing the battery. • Organization of RAM, types of RAM's, Module types, pins, replacement procedure and precautions. Compatibility of memory modules to the motherboard. • Type of processors, generation, features, speed, popular manufacturers. Advantages and possibility of upgrading Processor of a PC. Motherboard/ Chipset/ speed/ connector/ power/other compatibility criteria for upgrading processor. • Precautions to be taken while removing and placing processor in sockets and slots. • Types of jumper settings on motherboard. Its functions and effects.

			• CMOS set-up features. Need and procedure for changing the CMOS set-up. Updating Flash BIOS. (07 hrs.)
		Memory 273. Identification of different types of memory devices. (8 hrs) 274. Identification of memory chips. (8 hrs) 275. Identification of SIMM and DIMM memory modules, number of pins, type. (9 hrs)	• Memory devices, types & principle of storing. Data organization 4 bit, 8 bit, word. • Semiconductor memories, RAM, ROM, PROM,EMPROM, EEPROM, Static and dynamic. • Example of memory chips, pin diagram, pin function of popularly used RAM, EPROM, and EEPROM Chips in PC's. (07 hrs.)
Industrial Visit/ Project Work **Broad Areas:** a) Disassemble a given Desktop / Laptop PC totally following the safety precautions. b) Reassemble the Desktop / Laptop PC and test for its satisfactory performance. c) Install Operating System and necessary driver, taking backup and restore system. d) Rectify a defective system and make it as smooth working system. e) Troubleshoot / Repair /Replace an SMPS/RAM. f) Check Hard disk error, partition, format different types of Hard disk drives.			

SYLLABUS FOR INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE TRADE			
SECOND YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) with Indicative hrs.**	**Professional Knowledge (Trade Theory)**
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Install and customize Linux operating system.	**Linux operating system** 276. Installing UNIX/ LINUX. (05 hrs) 277. Preparing functional system UNIX/ LINUX. (05 hrs) 278. Adding new users, software, material components. (05 hrs) 279. Making back-up copies of the index and files. (05 hrs) 280. Dealing with the files and indexes. (05hrs)	• Basic Linux commands. • Linux file system, The Shell, Users and file permissions, VI editor, X window system, Filter Commands, Processes, Shell Scripting. (09 hrs.)
Professional Skill 100Hrs; Professional Knowledge 36 Hrs	Install Printer, Scanner and troubleshoot their faults.	**Printers & Plotters** 281. Testing front panel controls. Interface pins, cables, measurement of voltages and waveforms. (2 hrs) 282. Installing a printer and carrying self- test. (2 hrs) 283. Replacing ribbon in a DMP. (1 hr) 284. Refilling ribbon tape of DMP. (2 hrs) 285. Testing and rectifying defective cable. (2 hrs) 286. Removing and cleaning printer head. (1 hr) 287. Replacing a new printer head. (2 hrs) 288. Testing and servicing Printer power supply. (2 hrs) 289. Changing rollers and other	• Types of printers, Dot Matrix printer's 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. • Installation of a printer driver. And self-test. • Ribbon types used. • Refilling of ribbons. • Printer cable testing defects, effect and servicing. • Printer head, types, cleaning procedures. • Precaution to be taken while removing and replacing printer

		mechanical parts. (2 hrs) 290. Tracing the control board and identifying defective components. Servicing of control board. (2 hrs) 291. Replacement of toner cartridge of laser printers. (2 hrs) 292. Refilling toner cartridge of laser printers. (2 hrs) 293. Drum cleaning and replacement in of laser printers. (2 hrs) 294. Testing and servicing Printer power supply of laser printers. (2 hrs) 295. Changing mechanical parts of laser printers. (2 hrs) 296. Tracing the control board circuit and identifying defective components. Servicing of control board of laser printers. (2 hrs) 297. Replacement of ink cartridge of desk jet/ inkjet printers. (2 hrs) 298. Refilling ink cartridge of desk jet/ inkjet printers. (2 hrs) 299. Drum cleaning and replacement in desk jet/ inkjet printers. (2 hrs) 300. Testing and servicing Printer power supply of desk jet/inkjet printers. (2 hrs) 301. Changing mechanical parts of desk jet/inkjet printers. (2 hrs) 302. Tracing the control board and identifying defective components. Servicing of	head assembly. • Pinter power supply, circuit analysis, defects, servicing. Circuit, function, probable defects, servicing. • Carriage motor assembly, paper feed assembly, sensors. Procedure for dismantling and replacing mechanical parts. • Printer control board, circuit, function, probable defects, servicing. • Working principle of LASER printer. • Toner cartridge, types, replacing toner cartridges • Refilling toner cartridges, equipment available for refilling and procedure. • Printer drum, function, cleaning and replacing procedure. • Power supply in laser printers, circuit, defects, servicing. • Mechanical parts and sensors on laser printer, function, replacement procedure. • Control board(s) in laser printer, circuit diagram, defects and servicing procedure. • Working principle of Inkjet/ Deskjet printers. Type of ink used and replacement of ink cartridge. • Refilling of ink, equipment available, quality of refilled cartridges. • Printer drum, function, cleaning and replacing procedure.

		control board of deskjet/ inkjet printers. (2 hrs) 303. Connecting and using high speed line printers. (2 hrs) 304. Replacing spares of line printers. (2 hrs) 305. Self-test procedures in printers. (2 hrs) 306. Use of diagnostics software for serving printers. (2 hrs)	• Power supply in inkjet printers, circuit, defects, servicing. • Mechanical parts and sensors on inkjet printer, function. • Working principle of Plotter and its common faults. (18 hrs.)
		Scanner & MFD 307. Scanner - Installation, configuration, using Automatic Document Feeder (ADF), OCR. (6 hrs) 308. Barcode Scanner - Installation and configuration. (6 hrs) 309. Network Scanner - Installation and configuration. (6 hrs) 310. Troubleshooting of Scanner. (6 hrs) 311. Multifunction Printer - Installation, Replacing supplies and spares, troubleshooting. (8 hrs) 312. Passbook Printer - Installation, calibration, configuration & troubleshooting. Replacement of Supplies and maintenance. (6 hrs) 313. Network Printer – Installation and configuration, troubleshooting. (6 hrs) 314. How to update the flash of Motherboard, printer, scanner and modem etc. (6 hrs)	• Working principles of Network Scanner. • Working principles of Multifunction Printer. • Working principles of Passbook printer. • Working principles of High Speed Printer. • Working principles of Line Printer. • Working principles of Network Printer. • Working principles of Print Server. (18 hrs.)
Professional	Install/Replace	**Monitor, Display Card and Driver**	• Types of monitor, Monochrome

Skill 50 Hrs; Professional Knowledge 18 Hrs	Display Driver Card, perform servicing and configure various display unit.	315. Identify the type of monitor connected to PC. Specifications, front panel controls and settings. (6 hrs) 316. Identify the specifications of the display driver card installed in the PC. (6 hrs) 317. Remove the display driver card and identify the main components and connectors on the display driver card. (6 hrs) 318. Replace the display driver card and re-install. (before practicing this skill set, the already installed driver should be removed from device manager). (6 hrs) 319. Change the exiting display card with a different card given and install. (6 hrs) 320. 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. (8 hrs) 321. Install, configure and operate LCD Projector. (6 hrs) 322. Install and Configure Touch Pad. (6 hrs)	and color, CGA, EGA, VGA, SVGA, Digital Analogue, interlaced non-interlaced. Specifications and Comparison of Monitors. Front panel controls brightness, contrast, and horizontal and vertical height settings. • Display cards, bus standards, types CGA, EGA VGA, SVGA, AGP, memory and drivers. •

Skill 50 Hrs; Professional Knowledge 18 Hrs	Sound Card and set properties to adjust sound quality.	323. Identify the specifications of the installed sound card in the PC. (6 hrs) 324. Identify and adjust the playback and recording properties of sound card/ driver. (6 hrs) 325. Remove the sound card from PC and identify the main components on the card. (6 hrs) 326. Replace the card and reinstall the sound card and set properties. (7 hrs) 327. Change the existing sound card with a different card given and install. (6 hrs) 328. Connect the speaker and microphone, adjust the controls for better quality sound and testing. (7 hrs) 329. Interconnect laptop to a multimedia projector and carryout adjustments. (6 hrs) 330. Replace battery pack in laptops and carryout general maintenance. (6 hrs)	16/32 bit stereo moNo. • Frequency response, sound files format, compression and decompression. • Principle of working and functional units of sound card. • Installation procedure of sound cards. Setting playback and recording features. • Main components on a sound card and its working. • Properties and specification of sound cards. • Information and resources required before installation of sound card. • Type of speaker and microphone, frequency response, control adjustments, cable and connectors of speaker. • Laptops, advantages, essential difference in construction, additional features, PCMCIA cards. • General maintenance procedures and replacement of battery. (18 hrs.)
Professional Skill 50 Hrs; Professional Knowledge 18 Hrs	Perform maintenance and servicing of UPS.	**UPS** 331. Identify the specifications of UPS. (6 hrs) 332. Switch-on and Switch-off procedure of UPS. (6 hrs) 333. Measurement of Input/ output voltage/ current levels, battery charge level. (6 hrs) 334. Identifying status of UPS from front panel indicators. (6 hrs)	• Study of typical working UPS circuit, explanation of each stage involved. Voltage, current, frequency and KVA specifications. • Controls of different type of UPS: On-line, Off- line, Line interactive etc. • Typical circuit blocks. • Routine maintenance of battery

		335. Carryout routine maintenance of battery, battery terminals, loose contacts etc. (6 hrs) 336. Test UPS as per specification. Verification of back-up time. (6 hrs) 337. Circuit tracing and fault finding practice. (6 hrs) 338. Servicing of UPS by simulating more likely faults and systematic approach to identify and rectify them. (8 hrs)	and UPS. • Back-up time, its dependence on battery, load and its calculations. • Possible problems in UPS, fault finding procedures. • Simulated faults and serving of UPS. (18 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09Hrs	Install and configure Modem, System Resources, Add on Cards, Cables & Connectors.	**Modem** 339. Installation and configuration of different types of Modem e.g. DSL, ADSL, Data Card, Dongle etc. (08 hrs) **System Resources** 340. Practice on setting IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play. (08 hrs) **Practice on Add on Cards, Cables & Connectors** 341. AGP, PCI Express, TV Tuner Card, DVR card, Video Capture, SCSI. USB, NIC, Fire wire, Card reader, network storage, Game video card, Camera etc. (09 hrs)	• Modem Fundamentals. • Band width, baud rate, wireless communication, synchronous/ asynchronous transmission. • IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play Concept. • Different latest Add on Cards - (Identification in terms of I/O slot and connectors). (09 hrs.)
Professional Skill 125Hrs; Professional Knowledge 45Hrs	Upgrade, maintain and troubleshoot PC.	**POST Code** 342. Rectify the serial, parallel and USB problem by reinsertion or replacement. (3 hrs) 343. Rectify the printer's problem by reinsertion or replacement. (3 hrs)	• Recognize POST error message code as an indication of a serial, parallel and USB problem. • Recognize POST error message code as an indication of a printer's problem. • Recognize POST error message

		344. Rectify the MODEM problem by reinsertion or replacement. (3 hrs) 345. Rectify the windows start-up problem by reinsertion or replacement. (4 hrs) 346. Rectify the illegal operational problem by reinsertion or replacement. (3 hrs) 347. Rectify the virus protection utility problem by reinsertion or replacement. (3 hrs) 348. Rectify the networks problem by reinsertion or replacement. (3 hrs) 349. Rectify the external devises problem by reinsertion or replacement. (3 hrs)	code as an indication of a MODEM problem. • Recognize POST error message code as an indication of a windows start-up problem. • Recognize POST error message code as an indication of an illegal operational problem. • Recognize POST error message code as an indication of a virus protection utility problem. • Recognize POST error message code as an indication of a networks problem. • Recognize POST error message code as an indication of an external devises problem. (09 hrs.)
		Upgrading of System 350. Mother board, Memory, CPU, Graphic Card, BIOS up-gradation, Additional features, Updating of System Software & Application Software (Requirement & How to update). (30 hrs) **Practice on Backup Drives** 351. Pen Drive U3 format, Zip Drive, Tape Drive, USB External Drive (HDD, CD/ DVD writer), Types, capacity, interface connector, write protection, Troubleshooting, Interface, Installation, casing for external drive. (20 hrs)	• Understand the limitation of a PC and scope for upgrading. • Understand technical specifications for PC upgrading. • Introduction to removable storage devices, Bulk data storage devices magnetic, optical, magneto optical drives, WORM drives. • Minor repairs and maintenance of CD ROM drives. • Technology, working principle, capacity, and media of ZIP drives. • Important parts and functions of a ZIP drive. • Minor repairs and maintenance of ZIP drive. • Important parts and functions of DAT drive.

			• Minor repairs and maintenance of DAT drive. • Important parts and functions of DVD ROM drive. • Minor repair works on a DVD ROM drive. • Minor repair works on a CD WRITER. • Technology, working principle, capacity, and media of Magneto-Optical Disk (MOD) drives. Applications. • Important parts and functions of MOD drive. • Minor repair works on MOD. • Latest trends in backup devices/ media. (18 hrs.)
		Maintenance and Troubleshooting of PC 352. 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. (3 hrs) 353. Identify the defect in PC from the audible and observable symptoms such as beep sounds, post messages. Hanged keyboard, erratic display etc., and corrective action. (3 hrs) 354. Tracing the circuit of a KB. (3 hrs) 355. Troubleshooting defects related to Keyboard and its related ports loose	• 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 & Passive Maintenance, Maintenance scheduling. Need of diagnostics program. Features, limitations. Examples of commonly used diagnostic programs. • Probable defects in PC. Localizing faults through its observable visual or audio symptoms and possible methods for rectification/ servicing. Understanding serviceability of component. Economy in repair/

		connections, replacing cable, replacing keys (DIN, PS/2, USB). (3 hrs) 356. Trouble shooting defects related to Mouse and its related ports loose connections, replacing cable, replacing roller and sensing elements. (COM, PS/2, USB). (3 hrs) 357. Study of interface cable connector, replacing of subassemblies of Light pen, scanner, digitizer. (3 hrs) 358. Troubleshooting defects related to HDD, (practice of replacing motor, head, PCB among faulty drives) cable and connector. (4 hrs) 359. Troubleshooting defects related to CD ROM Drive, Attempting for replacement and adjustments) cable and connector. (4 hrs) 360. Troubleshooting defects related Ports to Jumper setting. (4 hrs) 361. Troubleshooting defects related to Processor. (4 hrs) 362. Troubleshooting defects related to RAM memory modules. (4 hrs) 363. Troubleshooting defects related BIOS. (4 hrs) 364. Troubleshooting defects related to CMOS setup. (4 hrs) 365. Troubleshooting defects related to Battery. (4 hrs)	replacement. • Block diagram of a KB, function of controller, LED driver Sample circuit. • Defects related to Keyboard and its related ports (DIN, PS/2, USB) Discontinuity in cable, and bad keys. Servicing procedure. • Defects related to Mouse and its related ports (COM, PS/2, USB) and servicing procedure. • Working principle, electro mechanical circuits of Light pen scanner and digitizer. • Defects and symptoms related to HDD and its cable, connector and servicing procedure. • Defects related to CD ROM Drive jamming of mechanical assembly mal function of control circuit, and its cable, connector and servicing procedure. • Defects related to Ports jumper setting on motherboard and servicing procedure. • Defects related to processor, its socket, cooling and servicing procedure. • Defects related to RAM memory module connector and servicing procedure. • Defects related to BIOS, upgrading and servicing procedure. • Defects related to CMOS, COMS setup and servicing procedure. • Defects related to battery and servicing procedure. (18hrs.)

Professional Skill 50 Hrs; Professional Knowledge 18 Hrs	Assemble, replace and troubleshoot various parts of Tablet/ Smart Devices.	**Tablet/ Smart Devices** 366. Assembling & disassembling of different types of tablets/ Smart Devices. (5 hrs) 367. Testing of various parts with multimeter. (4 hrs) 368. Replacing of faulty parts. (4 hrs) 369. Fault finding & troubleshooting. (4 hrs) 370. Practice Advanced troubleshooting techniques. (5 hrs) 371. Flashing of various brands of tablets/ smart devices. (4 hrs) 372. Upgrading operating systems. (4 hrs) 373. Formatting of virus affected devices. (4 hrs) 374. Unlocking of handsets through codes and software. (4 hrs) 375. Troubleshooting settings faults. (4 hrs) 376. Working with iOS, Android, Ice-cream sandwich, Jellybeans. (4 hrs) 377. Installation of Phone Gap framework. (4 hrs)	• Circuit Board/ Motherboard Introduction. • Study of parts of a tablet PC/ smart devices. • Testing of various parts with multimeter. • Steps of repairing various hardware problems. • Advanced troubleshooting techniques. • Introduction of various software faults. • Flashing of various brands of tablets / smart devices. • Upgrading operating systems. • Locking &Unlocking of handsets. • Concept of iOS, Android, Ice-cream sandwich, jellybeans. • Concept of Phone Gap. (18 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Browse internet and work with Cloud Computing.	**Internet and Web Browser** 378. Practice web browsing using popular web browsing software, Configuring web browser. (1 hr) 379. Search for content using popular search engines. (1 hr) 380. Use favourite folder for browsing quickly. (2 hrs) 381. Downloading & Printing	*Internet and Web Browser* • World wide web and website. • Web Browsing and popular web browsing software. • Introduction to Search Engines, Popular Search engines. • Concept of Favorites Folder. • What is an Electronic Mail? • Email Addressing, BCC and CC, Inbox, Outbox, Address book,

		Webpages. (2 hrs) 382. Using e-mail – Opening & configuring email client, mailbox: inbox and outbox, Creating and sending e-mail, Replying to an e-mail message, Forwarding and e-mail message, Sorting and searching emails. (2 hrs) 383. Sending document/ softcopy by email, activating spell checking, using address book, Handling SPAM, Removal of Cookies. (2 hrs) **Cloud Computing** 384. Work with Cloud services. (15 hrs)	SPAM. *Cloud Computing* • Introduction to Cloud Computing, how to access Cloud service providers & to create an account. *IT Act & Law* • Introduction to Cyber Security. • Introduction to Cyber Laws & IT Act. • Importance of privacy and techniques to manage it. (09 hrs.)
Professional Skill 200Hrs; Professional Knowledge 72 Hrs	Set up and configure Networking System using various network devices.	**Components of the Computer Network** 385. Familiarization with various Network devices, Connectors and Cables. (10 hrs) 386. Understanding the Layout of network. (15 hrs)	• Introduction to Computer Networks – Advantages of Networking, Peer-to-Peer and Client/Server Network. • Network Topologies – Star, Ring, Bus, Tree, Mesh, Hybrid. • Type of Networks – Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN). • Internet, Ethernet, Wi-Fi, Bluetooth, Mobile Networking, Wire and wireless Networking. • Difference between Intranet and Internet. (09 hrs.)
		Crimping & Punching 387. Crimping practice with straight and cross CAT 5 cables. (15 hrs) 388. Punching practice in IO Box and patch panel. (15 hrs) 389. Crimping and making cables. (20	• Communication Media & Connectors – Unshielded twisted-pair (UTP), shielded twisted-pair (STP), Fiber Optics and coaxial cable: RJ-45, RJ-11, BNC.

		hrs)	• Understanding color codes of CAT5 cable. 568A and 568B convention. (18 hrs.)
		Cabling 390. Create cabling in a lab with HUB/ Switch and IO Boxes and patch panel. (20 hrs) 391. Fitting Switch Rack. (5 hrs)	• Introduction to Data Communication – Analog and Digital Signals, Simplex, Half-Duplex and Full-Duplex transmission mode. (09 hrs.)
		Install & configure a Network 392. Installing & Configuring a Peer-to-Peer Network using Windows Software. (15 hrs) 393. Making cables by crimping. (5 hrs) 394. Connect computers using Bluetooth. (5 hrs)	• OSI Model - The functions of different layers in OSI model. (09 hrs.)
		Configuration of Data communication equipments 395. Connecting computers with Network with Drop cable and using Wi-Fi configuration. (08hrs) 396. Basic Programmable switch Configuration Spanning Tree Protocol (STP). (07hrs) 397. Command Line Interface. (05hrs) 398. IP Routing Process. (03hrs) 399. Verifying Configuration. (02hrs)	• 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 (09 hrs.)
		IP Addressing & TCP/ IP 400. IP addressing technique (IP4/ IP6) and Subnetting and Supernetting the network. (6 hrs) 401. Installation and Configuration of TCP/ IP Protocol. (6 hrs) 402. Practice TCP/ IP Utilities: PING, IPCONFIG, HOSTNAME, ROUTE, TRACERT etc. (6 hrs)	• 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

		403. Setup and configure a Virtual LAN. (7 hrs)	(VTP). • Concept of Translator Gateways. (09 hrs.)
		Other Network Protocols 404. Working with SMTP, TELNET, FTP, HTTP, SNMP, LDAP etc. (15 hrs) 405. Practice on configuring DHCP. (10 hrs)	• Simple Mail Transfer Protocol (SMTP), Telnet, File Transfer Protocol (FTP), Hyper Text Transfer Protocol (HTTP), Simple Network Management Protocol (SNMP). • LDAP (Lightweight Directory Access Protocol). • Network Security. Concept of Dynamic Host Control Protocol. (09 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Share and control resource and Internet connection through network.	**Sharing Resource & Internet connection** 406. Sharing Resource and Advance Sharing Setting. (5 hrs) 407. Installing Proxy Server. (5 hrs) 408. Exposure and using Internet. Setting E-mail accounts. Conferencing. (5 hrs) 409. Installing and Configuring Internet. (5 hrs) 410. Connection on a PC using Broadband or Dongle. (5 hrs)	• Concept of Internet. • Architecture of Internet. • DNS Server. • Internet Access Techniques, ISPs and examples (Broadband/ Dialup/ WiFi). • Concept of Social Networking Sites, Video Calling & Conferencing. Concept of Virus and its Protection using Anti-Virus, UTM and Firewall. (09 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Implement Network Security to protect from various attacks on networking.	**Network Protection and troubleshooting** 411. Setting up basic protection using public keys and MAC address filters. (10 hrs) 412. Integrate wired with wireless network. (5 hrs) 413. Power over Ethernet (PoE). (5 hrs) 414. Troubleshooting wired and	• Collaborating using wired and wireless networks, Protecting a Network, Network performance study and enhancement. (09 hrs.)

		wireless network. (5 hrs)	
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Share and control resource and Internet connection through network.	**Control & monitoring of network devices** 415. Setting up of basic collaboration tool like NetMeeting for activities like chat, application sharing, remote desktop access and control, VoIP. (15 hrs) 416. Setup IP camera for basic surveillance scenario, logging and monitoring of devices/ locations. (10 hrs)	• Surveillance using network devices, collaboration on network for team optimization and support activities. • Remote management of devices. (09 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Implement Network Security to protect from various attacks on networking.	**Network Security** 417. Practice on firewall technologies to secure the network perimeter. (10 hrs) 418. Practice LAN security considerations and implement endpoint and Layer 2 security features. (10 hrs) 419. Wi-Fi configuration to implement security considerations. (5 hrs)	• 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. (09 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Perform installation and basic configuration of Windows Server.	**Server Installation & Basic Configuration** 420. Identify Server Hardware. (5 hrs) 421. Install and configure Windows Server. (5 hrs) 422. Install and Configure Active Directory. (5 hrs) 423. Implementing AD Services. (5 hrs) 424. Configuration of broadband modem and sharing internet connection. (5 hrs)	• 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. (09 hrs.)
Professional Skill 75Hrs;	Demonstrate installation, configuration of	**Install & configure DNS** 425. Installing and Configuring DNS Services	• Concept of DNS. • Name resolution – Host names, NetBIOS names.

Professional Knowledge 27 Hrs	DNS, Routing and user account customization.	- Setup Name resolution – Host names, NetBIOS names. - Installing DNS Server. - Configuring DNS Zones, DNS Clients, Delegating Zones. - Testing DNS with nslookup, dnscmd and dnslint. (13hrs) 426. Installing and Configuring DHCP Services - DHCP Server Configuration. - Setting up of DHCP, Routing and remote access. (12hrs)	• DNS Overview. • DHCP Overview. • DHCP Clients and Leases. (09 hrs.)
		Routing and Remote Access 427. Configuring RRAS. (5 hrs) 428. VPN implementation. (5 hrs) 429. Configuring Remote Access Authentication Protocol. (5 hrs) 430. Configuring RRAS Policies. (2 hrs) 431. Configuring IAS. (3 hrs) 432. Managing TCP/ IP Routing. (5 hrs)	• Remote Access Overview. • VPN Concepts. • Remote Access Authentication Protocol. • RRAS Policies. • IAS. • TCP/ IP Routing. (09 hrs.)
		Planning and Implementing User and Group Strategies 433. Adding Account. (2 hrs) 434. Implement AGDLP Process. (5 hrs) 435. Implement User Authentication Strategy. (5 hrs) 436. Planning and Implementing OU Structure. (3 hrs) 437. Planning and Maintaining Group Policies - Configuring User Environment. (5 hrs) 438. Configuring Computer Security. (5 hrs)	• Concept of User and Group. • Planning Security Group Strategy. • AGDLP Process. • Planning User Authentication Strategy. • Planning OU Structure. • Planning a Group Policy Strategy. • Deploying Software Through GPO. (09 hrs.)
Professional Skill 75 Hrs; Professional Knowledge	Configure Server and manage Server Network security and Infrastructure.	**Server Configuration & Backup** 439. Configure a server as web server. (15 hrs) 440. Configuring Mailbox Servers. (5 hrs)	• Introduction to Web Server • Introduction to Messaging Services. • Concept of Backup and Recovery of Server. (09 hrs.)

27 Hrs		441. Implementing Backup and Recovery. (5 hrs)	
		Managing Server Network Security 442. Security Baseline Settings and Templates. (5 hrs) 443. Configuring Audit Policy. (5 hrs) 444. Monitoring and Troubleshoot Network protocol. (5 hrs) 445. Configuring Protocol Security. (5 hrs) 446. Planning security for Wireless Network. (5 hrs)	• Security Baseline and Templates. • Audit Policy. • Understanding IPSec. • Protocol Security. • Planning security for Wireless Network. (09 hrs.)
		Maintaining Network Infrastructure 447. Monitor Network Traffic. (5 hrs) 448. Troubleshoot Internet Connectivity. (10 hrs) 449. Troubleshoot Server Services. (5 hrs) 450. Use Linux Network Tools to check/ maintain/ Manage Network. (5 hrs)	• Managing Network Traffic • Types of Problems of Internet Connectivity. • Types and working of Server Services. (09 hrs.)
Professional Skill 25Hrs; Professional Knowledge 09 Hrs	Perform installation and basic configuration of Linux server.	**Linux Server installation and configuration** 451. Install Linux Server. (5 hrs) 452. Create new user and group. (2 hrs) 453. Create public and data directory. (2 hrs) 454. Create anlmlhosts file. (3 hrs) 455. Check host file. (2 hrs) 456. Secure and run SWAT. (3 hrs) 457. Filter ports. (3 hrs) 458. Telnet installation and configuration. (5 hrs)	• Configuration Plan. • Public and data directory. • Host file. • SWAT. • Password Authentication. • Telnet. (09 hrs.)
Industrial Visit/ Project Work **Broad Areas:** a) Setting up a LAN of at least 3 PCs using HUB/ Switch and structured cabling. b) Configuration of Switch/ Router, Setup a wireless LAN with security features, Invoking Network security. c) Installation & configuration Windows server. d) Installation & configuration of LINUX Server.			

SYLLABUS FOR CORE SKILLS
1. Workshop Calculation & Science(Common for two year course) (80Hrs + 80 Hrs)
2. Engineering Drawing (Common for Group-II (Electrical, Electronics & IT Trade Group))(80Hrs + 80 Hrs)
3. Employability Skills(Common for all CTS trades) (160Hrs + 80 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in

List of Tools & Equipment			
INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE (For batch of 24 candidates)			
S No.	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Connecting screwdriver	100 mm	25Nos.
2.	Neon tester	500 V	25Nos.
3.	Screw driver set	set of 5	25Nos.
4.	Insulated combination pliers	150 mm	25Nos.
5.	Insulated side cutting pliers	150 mm	25Nos.
6.	Long nose pliers	150 mm	25Nos.
7.	Soldering iron	25 W. 240 V	25Nos.
8.	Electrician knife		25Nos.
9.	Tweezers	100mm	25Nos.
10.	Digital Multimeter		25Nos.
11.	Soldering Iron Changeable bits	15 W	25Nos.
12.	De- soldering pump		25Nos.
B. LIST OF TOOLS REQUIRED			
13.	Crimping tool (pliers)		2 Nos.
14.	Soldering Iron	25W	6 Nos.
15.	Magneto spanner set		2 Nos.
16.	Screw driver	150mm	4 Nos.
17.	Steel rule	150mm	2 Nos.
18.	Scriber straight	150mm	2 Nos.
19.	Soldering Iron	240W	1 Nos.
20.	Allen key set	set of 9	2 Nos.
21.	Tubular box spanner	set of 6	1 No.
22.	Magnifying lenses	75mm	3 Nos.
23.	Continuity tester		6 Nos.
24.	Soldering iron	10W	6 Nos.
25.	Cold chisel	20mm	1 No.
26.	Scissors	200mm	1 No.
27.	Handsaw	450mm	1 No.
C. TOOLS & EQUIPMENTS (Computer Hardware: Installation and Maintenance)			
28.	Server Computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher.	01 No.

		Cache Memory: - Minimum 3 MB or better. RAM:-8 GB DDR-III or Higher. Hard Disk Drive: 500GB or Higher, 7200 rpm (minimum) or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet (10/100/1000) - Wi-Fi, USB Mouse, USB Keyboard and Monitor (Min. 17 Inch), Standard Ports and connectors. DVD Writer, Speakers And Mic. Licensed Windows Operating System / OEM Pack (Preloaded), Antivirus / Total Security	
29.	Desktop Computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	12Nos.
30.	Laptop, Notebook		01 each
31.	Intel Mobile Desktop based PC with LCD monitor	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	01 No.
32.	Tablet		02 Nos.
33.	Printers: LaserJet, DeskJet, passbook, mfd		01 each
34.	Network Printer		01 No.
35.	Online UPS		As require
36.	LAN Cards, Wi-fi LAN Cards		06 Nos. each
37.	LCD/DLP Projector		01 no
38.	Power Meter		02 nos.

39.	Crimping Tools		06 nos.
40.	Computer Toolkits		06 Nos.
41.	Computer Spares:		As required
42.	Motherboards (of different make)		4 Nos.
43.	Cabinets		4 Nos.
44.	Processors (of different make)		4 Nos.
45.	Hard Disk different types	1 TB or higher	4 Nos.
46.	Optical Drives		4 Nos.
47.	LCD/LED/TFT Monitors		2 Nos.
48.	Pen Drives		4 Nos.
49.	External Hard disk		2 Nos.
50.	External DVD Writer		2 Nos.
51.	Keyboards		4 Nos.
52.	Mouse		4 Nos.
53.	Anti static pads		4 Nos.
54.	Anti static wrist wraps		4 Nos.
55.	SMPS		4 Nos.
56.	Digital Multimeters		12Nos.
57.	Blu-Ray drive and player		2 Nos.
58.	External Hard Disk		2 Nos.
59.	Digital Camera		2 Nos.
60.	HD Display		2 Nos.
61.	Network storage		2 Nos.
62.	Card Reader		2 Nos.
63.	Game video card		2 Nos.
64.	Web Cam		2 Nos.
65.	Surround sound speakers		2 Nos.
66.	Different types of memory cards		2 Nos. each
67.	Laptop kits		12 Nos.
68.	Laptop spares: Cabinet with display, memory, hard disk, battery pack, keyboard membrane, chargers		As required
69.	SMPS Trainer kit		2 Nos.
70.	UPS Trainer kit		As require
71.	Power electronics Trainer kit		2 Nos.
72.	Post error debugging card		4 Nos.
73.	SMPS Tester		4 Nos.
74.	PCI slot Testing tool		4 Nos.
D. SOFTWARE			
75.	Windows Server Operating System		1 license

76.	Windows Operating System		2 licenses
77.	Linux Operating System		2 Nos.
78.	Network Management Software		1 No.
79.	MS Office		2 Nos.
80.	Anti-virus software		2 Nos.
81.	Data recovery software		2 Nos.
82.	LINUX Server Operating System (Samba / Su-se)		1 No.
83.	Open source Pc Utility / Tweak Software		As availabe
E. FURNITURE and Other Equipments			
84.	Computer Tables		12 Nos.
85.	Computer Chairs		24 Nos.
86.	Printer Table		1 No.
87.	Class Room Chairs		24 Nos.
88.	Air Conditioners		As required
89.	Scanner		1 No.
90.	Modem		1 No.
91.	Telephone Line		1 No.
92.	Broadband Internet Connection		1 No.
93.	Fire Fighting Equipments		As required
94.	Hardware and Network Trainer Kit		6 Nos.
F. TOOLS & EQUIPMENTS (Computer Networking)			
95.	Wireless Network Adapter		6 Nos.
96.	Wireless Access Point		4 Nos.
97.	Router		4 Nos.
98.	Managed Layer 2 Ethernet Switch	8/16/24 port	2 Nos.
99.	Managed Layer 3 Ethernet Switch	8/16/24 port	2 Nos.
100.	Network Training System		2 Nos.
101.	LAN Protocol Simulation and Analyser Software		2 Nos.
102.	Network and Internet security trainer		2 Nos.
103.	LAN cable tester		2 Nos.
104.	Network cables – UTP		As required
105.	Network Cables – coaxial, flat, ribbon		As required
106.	LAN Cards, wi-fi LAN Card		05 Nos.each
107.	Connectors for cables		As required
108.	Power Meter		2 Nos.
109.	Media Convertor		4 each
110.	UTP jack panel	8/16/24 port	2 Nos.

111.	SC Couplers		12 Nos.
112.	SC Pigtails		12 Nos.
113.	RJ-45 connector		As required
114.	Fluke Meter		2 Nos.
115.	Crimping Tools		6 Nos.
116.	Switch with POE ports		2 Nos.
117.	POE adapters		2 Nos.
118.	Network Camera (Outdoor/ Indoor)		2 No. each
119.	Fibre Optics cable with LC connector		As required
120.	LC connector module		As required

ANNEXURE – II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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4	K. Ganesan Vice President -Global Head Talent Acquisition Group TCS House, Raveline street Fort, Mumbai - 400 001	TCS, TCS House, Raveline street, Fort, Mumbai - 400 001	Member
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32	Kunal Shanti Priya, VI	ITI, Daltonganj, Jharkhand	Member
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38	P. Parthiban, Assistant Training Officer (ITESM)	Govt ITI(W),Salem, TN	Member
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ABBREVIATIONS:

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities

कौशलं बलम्