कौशल बलम्

Draft Syllabus for the Trade of

Information & Communication Technology System Maintenance

Under

Craftsmen Training Scheme

Designed in
2014

Government of India
Ministry of Labour & Employment
D.G.E. & T

GENERAL INFORMATION FOR

INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE

Name of the Sector	**IT & ITES**
Name of CTS Course	***INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE (as suggested by the experts)***
CTS Code	**To be generated**
Competency as per N.C.O. Code	**To be generated** (reviewed version of "Information Technology and Electronic System Maintenance")
Duration of Course	**Two Years divided in four Semesters of Six Months each.**
Entry Qualification of Trainee	**Passed 10th with Science and Maths as subjects.**
Unit size (No. of Trainees)	**20**
Power Norms	**3.45 KW**
Space Norms (Workshop and Class Room)	**Lab. - 70 Sq. m., Class Room – 30 Sq. m.**
Qualification for the Instructor	***Technical*** **–** **(i) Graduate in Engineering / Technology in Computer Science / IT/Electronics & Communication from Recognized university *OR*** **(ii) Post Graduate in Computer Science / Computer Application / IT /Electronics *OR*** **(iii) Bachelor in Computer Science / Computer Application / IT *OR* NIELIT A Level *OR*** **(iv) Three year Diploma from recognized Board / Institution in Computer Science / IT/Electronics & Communication *OR*** **(v) National Apprenticeship Certificate or National Trade certificate in Information & Communication Technology System Maintenance trade and National Craft Instructor Training Certificate in the trade if available.** ***Experience in relevant field after eligible qualification*** **–** **For (i) & (ii) - One year** **For (iii) & (iv) - Two years** **For (v) - Three *years* after NAC/NTC**

Job Role:

The role of a **Information & Communication Technology System Maintenance** personnel is to support and maintain computer systems, desktops, and peripherals. This includes installing, diagnosing, repairing, maintaining, and upgrading all hardware and equipment while ensuring optimal workstation performance. The person will also troubleshoot problem areas in a timely and accurate fashion, and provide end user training and assistance where required. Install, maintain and setup network with computers, printers and other peripheral equipment as well as configure broadband equipment.

In a Nutshell :

- Installing software or hardware
- Maintaining and repairing equipment / peripherals.
- Troubleshooting different computer issues
- Determining and installing appropriate security measures
- Installing & Configuring advanced computer networks
- Providing technical support on-site or via phone or email
- Install, configure, and maintain common end user application software. May train and provide assistance to end users.
- Troubleshoots software and hardware problems related to Internet applications.
- Assist the information technology administrators with configuration, maintenance and monitoring of access servers, routers, Microsoft and Linux servers and Internet servers including DNS, radius, web, LDAP, e-mail, network monitoring and print servers.
- Assist in preparing, maintaining, and upholding procedures for logging, reporting, and statistically monitoring PC performance.
- Accurately document instances of hardware failure, repair, installation, and removal.
- Assist in developing long-term strategies and capacity planning for meeting future computer hardware needs.
- Support development and implementation of new computer projects and new hardware installations.

Syllabus for the Trade of

"INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE"

Under CTS

Semester – I ***Duration : 6 months***

Week No.	Practical	Theory	Engineering Drawing	Workshop Cal. & Sc.
1	***Familiarization with the Institute and Safety*** a) Visits to workshops, labs, office, stores etc., of the institute. b) Demonstration of safety precaution. c) Demo of first aid practice. d) Demo of artificial respiration and practice. e) Demo of electrical safety precautions.	a) Punctuality and Discipline expected of trainees. Course duration, methodology and structure of the training program. b) About the institute and infrastructure. c) Safety in moving and shifting heavy and delicate equipments. d) First aid. e) Artificial respiration. g) Electrical safety.	What is Engineering drawing, Importance	Quadratic equation, Simultaneo us linear equation in two variables.
2	**Basic concepts of Electricity –** a)Identify specification of types of fuses. Identification and specification of type of switches. b) Identification of meter types and measuring range. c) Construct a simple circuit using AC/DC supply, lamp, fuse and switch. d) Measure circuit voltage and current using voltmeters and ammeters. e) Measure voltage and current using	a) 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. b) Circuit voltage and current. Measuring circuit voltage and current using voltmeters and ammeters. AC and DC meters. c) Measuring instruments, MC, MI	Free hand sketching of straight lines, rectangles, square, circles, polygons, etc.	Electricity: Negative & positive polarities, structure of Atoms, Electrons & protons, coulomb, unit of charge, volt, unit of potential difference, and charge in motion is current.

	Multi-meter (analog-digital). f) Use Multimeter to check fuses, lamps and switches. g) Measure DC and AC power using V-I method and using power meter.	type, Ammeter, Voltmeter, Multimeter for measuring voltage and current. Construction, characteristics/ features and specification. Digital Multimeter d) Meaning of Circuit and basic electrical circuits. e) Meaning of resistance, continuity and continuity testers. Multimeter for checking continuity. f) Concept of Power and measurement using V&I meter and Power meter.		
3-4	***Resistors. Soldering and De-soldering.*** a) Identify different types of resistors from physical appearance. b) Identify resistor value and tolerance using colour code. b) Measuring resistance using Multimeter. c) Soldering and desordering techniques, practice using hook-up wires. Soldering resistors on Tag board. d) Verification of Ohms Law and Kirchhoff's Laws. e)Soldering resistors on PCB. f)De-soldering practice. g) Experiment using P.T.C and NTC resistors.	a) Classification, characteristics and application of different types of resistors.-carbon film, metal film, wire wound, cermets and surface mounted. b) Colour coding of resistors. Calculating Imeasuring resistance value and its tolerance value. Wattage of resistors, specific resistance and their importance. c) Resistors in series and parallel. d) Soft soldering and precautions to be taken for making a good solder joint. Types of solder and need of soldering paste. e) Ohms law and Kirchhoff's Laws.	Free hand sketching of tools, reading of simple drawings and concepts of dimensions.	Fundamentals and derived units, Supplementary units, of electrical parameters.

	h) Experiment to check VDR's. i) Experiment to check LDR's. j) Test Pots, Presets.	f) Printed circuit boards and its application. g) De-soldering tools. h) Temperature dependent resistors and their applications.(PTC and NTC) . i) Voltage dependent resistors (VDR). j) Photoelectric effect, Light Dependent resistors. k) Variable resistors, pots, presets, types and application. Log and Linear resistors.		
5-6	***INDUCTANCE*** a) Identification of different types of inductors and its specifications. b) Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies. c) Demo on self and mutual induction. d) Check step down transformers. e) Rewind a transformer to given specification using winging machine. f) Finding losses and efficiency of given transformers. g) Identifying and testing high frequency transformers used in electronic circuits.	a) Definition of inductance. Properties. Types of inductors and their application. b) Inductive reactance, measuring inductance and inductive reactance. Meaning of lead, lag. Effect of inductor on power factor. Frequency dependence of inductive reactance. c) Self and Mutual inductance. Coefficient of coupling. d) Transformers. Turns ratio. Transformer winding. Winding machines. e) Transformer losses and efficiency. f) Uses, losses, efficiency type of cores and uses for LF, HF, VHF transformer. g) Transformers used in high frequency applications.	Dotted lines, chain lines etc. Magnifying glass.	Ohms law: Current, voltage, resistance, and related problems, multiple and submultiple s units, electric power, power dissipation in resistance, power formulas.
7-8	***Capacitance and Resonance circuits.*** a) Identify of different	a) Working principle of capacitors. Electrostatic action, dielectric constant. Unit of capacitance and capacitive reactance.	Reading of simple drawing, free hand sketching of simple solids with dimensions.	Series circuits: Total resistance, same current in

	types of capacitors from colour code and typographic code. b) Test working condition of capacitor. Measure capacitance using RLC meter. c) Measure capacitive reactance at different frequencies. d) Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel. e) Find the resonance frequency of a given Series and parallel resonance circuit.	Types of Capacitors-electrolytic, ceramic, polyester, tantalum, mica, surface mounted. Colour coding, and tolerance. b) Measuring capacitance and capacitive reactance. c) Behaviour of capacitance at different frequencies. d) Capacitors in series and parallel. e) Meaning of Resonance. Application of resonance. Series and parallel resonance circuits	Freehand sketch of solids viewed perpendicularly to their surface and axes.	series circuits, IR voltage drops, Sum of IR drops equal to the applied voltage.
9-10	**Electronic Components** – a) Identify terminals of different types of diodes. Record its specifications referring to diode data sheet. b) Plot forward and reverse characteristics of diode Testing working condition of diodes. c) Construct and test a half wave and full wave diode rectifiers. d) Construct and test a Bridge rectifier with and without filter e) Construct a bridge rectifier with capacitance input filter. f) Draw Zener diode characteristics, Simple voltage regulator using zener diode.	a) Semiconductor, intrinsic and extrinsic semi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown voltage. b) Different types of Diodes. Diode terminals. Diode specifications using data book. c) Forward and reverse characteristics of diode. Testing diodes using Multimeter. d) Half wave and Full wave rectifiers using diodes. Transformer requirements. Calculating output DC, ripple factor. e) Bridge rectifier. Calculating output DC, ripple factor. f) Filters for rectifiers. Calculating output DC, ripple factor. g) Zener diode-Its characteristics and	Electronic Component symbols, Series circuit, Representation of IR voltage drops. -	Polarity of IR voltage drops, Total power in series circuits, related exercise. -

		application for voltage regulation. Calculating the series resistor for required current rating. h) Specifications of a regulated power supply and testing a power supply for its specifications.		
11-12	***Transistor and Amplifiers*** a) Identify types of transistors based on their physical appearance. Identify the leads of the given assorted types of transistors. b) Quick test given transistors using Multimeter. Identify opens, shorted junctions . c) Wire and find the gain of amplifiers in – CB, CE, CC configurations.	a) Working principle of PNP, Bipolar transistors. Types of transistors and applications. Leads of transistors and their identification. b) Forward and reverse bias of transistor Junction. General values of junction resistances. Quick testing a transistor-using Multimeter. c) 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.	Free hand sketch of circuits and wiring diagrams.	Transistor amplifiers, Voltage Gain
13-14	***Special Semiconductors-FET*** a) Construct and test a JFET amplifier. b) Construct and test a MosFET application circuit. c) Construct and test a relaxation oscillator using UJT. d) Construct and test an application circuit	a) Field effect transistors, types, working principle, applications. b) Working principle and application of UJT. c) Working principle and application of SCR. d) Working principle and application of TRIAC. e) Working principle	Drawing of UJT triggered circuit with ISI symbols, power amplifier circuit, models as SCR, DIAC,TRIAC, voltage regulator ckt. Motor control ckt.	Direct-current meters: Moving coil meter, design of voltmeter, ammeter, loading effect of voltmeters, related problems.

	using SCR. e) Construct and test an application circuit using DIAC. f) Construct and test an application circuit using TRIAC.	and application of DIAC.		
15-16	***Power supply*** a) Practice on identifying and using the controls on a regulated power supply. b) Assemble and test a series regulated power supply. c) Assemble and test a shunt regulated power supply. d) Assemble and test a fixed voltage regulator using 3pin IC. e) Assemble and test a variable voltage regulator using IC. f) Assemble a simple inverter and converter for use with emergency lamp. g) Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures.	a) Unregulated, regulated DC Power supply specifications. Application of different types of power supply for specific application types. b) Series regulator using transistor. Short circuit protection. Overload protection. c) Shunt regulators using transistors. d) Fixed Voltage regulators using IC's. e) Variable voltage regulators using IC's. f) Mains voltage stabilizers. g) Inverters and converters. h) Un-interrupted power supply, types and applications.	Parallel circuits, Branch currents, representation.	Parallel circuits: Applied voltage is the same across parallel branches, Each branch current, Total current equal to the sum of the branch currents.
17-19	***DIGITAL ELECTRONICS*** a)Identify the specifications of given digital IC's referring to data books. b) Verify the truth table of two input OR, NOR, AND, NAND, NOT gates. c) Verify of truth table of multiple input logic gates. d) Verify the truth table	a) Number systems and conversions. Classification of digital IC's. Use of data book for identification of digital IC's. b) Basic LOGIC GATES and truth table. Boolean algebra. c) Logic families, logic levels, propagation delay. Multiple input gates.	Logic gates, Combinational gates, other circuits.	- Do -

	of XOR and XNOR Gates. e) Realization of different gate type using NAND gates. f) verification of Boolean laws. g) Realization of half adder & full adder using NAND gates. Realization half subtractor and full subtractor using NAND gates. h) Verification of truth table of 7483- 4bit adder. i) Verifying encoder/ decoder/ multiplexer/ demultplexer IC truth tables. j) Realization and verification of truth table of RS, JK and MS- JK flip-flop. k) Realization and verification of D-flip flop. l) Realization and verficiation of up & down (sync/async) counter. m) Verification of A/D & D/A converter. n) Realization of shift registers using FF. o) Verification of Right-shift, Left- shift registers. p) Verification of Serial-in-parallel out and parallel in serial out of data. q) Representation of logic function's truth table using K-Map.	d) XOR, XNOR gates and application. e) Simplification of Boolean equations. f) Combinational logic circuits. g) Half adder, full adder, parallel binary adder, half subtractor, full subtractor. h) Commercially available adders/subtractors. i) Comparator, decoders, encoders, multiplexer, demultiplexer. j) Parity generators / checkers. RS Flip – Flop, JK flip-flop, Master- Slave flip-flops. k) Types of triggering and applications. D flip-flops. l) Counters, ripple, synchronous, up-down, scale-n counters. m) Principles of A/D & D/A converter. Commercially available A/D & D/A converters. Applications. n) Shift registers. Types, applications. o) Commercially available shift registers and applications. p) Conversion of serial data into parallel and vice-versa. q) Concept of Karnaugh Map (K-Map).		
20	***Battery*** Familiarize with the lead acid battery,	Lead acid cell, its construction and chemical changes	Diagram of series, parallel connection of	Calculation related with Series, parallel

	Charging of batteries, Series parallel connection of batteries.	during charging and discharging. Battery charging methods. Maintenance free batteries. Lithium cell, Ni-cad cells their construction and applications.	batteries.	connection of batteries.
21	***Oscilloscope*** a) Identify CRO front panel controls. b) Measure of DC/AC voltages and frequency using CRO. c) Identify the internal parts of a CRO and CRT. d) Calibrate a given CRO.	Working principle and application. b) Precautions to be taken while measuring voltages using CRO. c) Internal parts of a CRO. Construction and function of CRT and its associated circuitry. d) Simple Calibration procedures care and maintenance.	Block diagram of a CRO.	Functions of x-shift, y-shift controls, time/div controls, Internal triggering and external triggering.
22-23	***Modulation, Demodulation and transmitters.*** a) Identifying AM signal. Measurement of percentage of modulation using CRO. b) Construct and test a simple Amplitude modulator. c) Construct and test a crystal receiver. d) Construct and test a simple Frequency modulator / transmitter. Test transmitter using FM radio.	a) Modulation – types of modulation. AM, FM, PM. Amplitude modulation. Measurement of percentage of modulation. b) AM Transmitter block diagram. Amplitude modulator circuit and working. c) AM receiver block diagram. Principle of an AM demodulator/detector – analysis of crystal receiver. d) Frequency modulation- bandwidth requirement. FM transmitter block diagram. Comparison with AM- advantages of FM over AM. e) FM receiver block diagram. Principle of Demodulation of	Introduction to different types of wave shape and drawing practice.	Fundamentals and derived units, Supplementary units of electrical parameters, Standards – definition, types – primary and secondary, working standards, Standards of length, mass, time, current, voltage.

		FM signals. f) Pulse modulation – PAM, PWM and PCM. Demodulators. Advantages and applications.		
24	***Other Mechanical, Electrical & Electronics Accessories.*** Working with Gears, Belts, Stepper Motor, Drive. Identification and Testing of Sensors. Working with Relays. Identification of different advanced Intel microprocessor chips. Identification of different advanced microprocessor chips other than from Intel.	Basics of gears, Belts, Stepper Motor, Drive. Sensors, its types and working principles. Relays, types and its working principles. Introduction to Microprocessor, Pentium processor architecture basics. Timing Circuits, Electronic Display (7 segment, LED, LCD, Plasma, LED matrix.	Types of resistors, colour coding, tolerance representation , Capacitor structure, symbol, types, colour code, Variable capacitors	Temperatur e, pressure. Newton's law of motion, applications , momentum. Simple problems
25	***Project Work (any one)*** Create a regulated power supply, Create amplifier using transistor, Create a bridge rectifier, AC to DC converter, Battery Charger etc.		Project related drawing.	Project related Calculation & Science.
26	**EXAMINATION**			

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Semester – II ***Duration : 6 months***

Week No.	Practical	Theory	Engineering Drawing	Workshop Cal. & Sc.
27	**Word Processing** a) Creating and saving document files using Word processing software. b) Formatting text and editing. c) Setting page and margins. Tabs and indents. d) Creating multicolumn documents. e) Inserting pictures in documents. f) Creating tables. g) Creating different types of documents. h) Saving word documents in other formats. i) Mail merge. j) Printing documents.	a) Introduction to word processing and comparison of features. Creating and saving document files using Word processing software. b) Formatting test and editing. c) Setting page and margins. Tabs and indents. d) Creating multicolumn documents. e) Inserting pictures in documents. f) Creating tables. g) Creating different types of documents. h) Saving word documents in other formats. i) Mail merge. j) Printing documents.	Flow charts showing steps in sample programs.	Voltage regulators, Voltage doublers, multipliers, Clipper circuits, related exercise.
28	**Spreadsheet Software** a) Creating Worksheets using Spreadsheet Software. b) Formatting cells. c) Using formula in cells. d) Creating simple spreadsheet for an application. e) Creating relation between sheets. f) Graphs and tables. g) Advanced features. h) Printing spread sheets.	a) Introduction to spread sheet. Creating Worksheets using Spreadsheet Software. b) Formatting cells. c) Using formula in cells. d) Creating simple spreadsheet for an application. e) Creating relation between sheets. f) Graphs and tables. g) Advanced features. h) Printing spread	- Do -	- Do -

		sheets.		
29	<u>*DeskTop :*</u> <u>*PC Repair Safety:*</u> • *Important Safety Basics* • *Identification, specification and application of basic hand tools.* • *How to handle components to ensure their longevity* • *What one shouldn't wear while working inside a computer* • *The danger of static electricity* • *How to protect a PC from lightning strikes and power outages*	*a) Introduction to computers, classification, generations, applications. Basic blocks of a digital computer.* *b) Hand Tools Basics and Specifications.* a) Types of cabinets, relation with mother board form factor. Precautions to be taken while opening and closing PC cabinet. b) Main devices, components, cards, boards inside a PC(to card or device level only). c) Types and specifications of the cables and connectors used for interconnecting the devices, boards, cards, components inside a PC. d) Precautions to be taken while removing and/or re-connecting cables inside a PC.	Block dig of personal computer, drawings of keyboard, monitor, mouse, FDD, HDD, floppy disc. CD ROM.	Logarithm definition, properties, simple problems.
30-31	<u>*Hardware Identification*</u> • *Identify the front and rear panel controls and ports on a PC* • *Cases* • *Cooling* • *Cables & Connectors* • *Power Supplies* • *Power Supply Connections* • *Motherboard Connections* • *Motherboard Components* • *CPU (Processor)* • *RAM (Memory)* • *Hard Drive Connections* • *Mechanical vs. Solid State Drives*	*(a) Types of I/O devices and ports on a standard PC for connecting I/O devices.* *b) Function of keyboard, brief principle, types, interfaces, connectors, cable.* *c) Function of Mouse, brief principle, types, interfaces, connectors, cable.* *d) Function of monitor, brief principle, resolution, size, types, interfaces,*	Front and Rear view of a PC	Alternating voltage and current: AC fundamentals, RMS, Average values.

	• *ROM Drives* • *Video Cards* • *Sound Cards*	*connectors, cable.* *e) Function of Speakers and Mic, brief principle, types, interfaces, connectors, cable.* *f) Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable.* *g) Precaution to be taken while connecting/removing connectors from PC ports. Method of ensuring firm connection.*		
32-34	**Hardware Remove-Test-Replace/ Install** • Removing RAM • Installing RAM • Removing a ROM Drive • Installing a ROM Drive • Removing a Hard Drive • Installing a Hard Drive • Removing a Power Supply • Installing a Power Supply • Removing a Video Card • Installing a Video Card • Install Expansion Cards • Removing Fans • Installing Fans • Removing the Motherboard • Installing the Motherboard	*Types of Processors and their specifications (Intel: Celeron, P4 family, Xeon, dual core, quad core, core 2 duo, i3,i5,i7 and AMD).* a) Memory devices, types, principle of storing. Data organization 4 bit, 8 bit, word. b) Semiconductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic. c) Example of memory chips, pin diagram, pin function of b) Concept of track, sector, cylinder. FD Drive components- read write head, head	Explanation of simple orthographic projection 3rd angle.	Arithmetic and geometric progression , sum of n terms, simple calculations

	• Removing the Processor • Installing the Processor • Installing a CPU Cooler • Troubleshooting • Checking the Power Switch • Removing the CMOS Battery • Seating Expansion Cards	actuator, spindle motor, sensors, PCB. c) Precaution and care to be taken while dismantling Drives. d) Drive bay, sizes, types of drives that can be fitted. Precautions to be taken while removing drive bay from PC. f) HDD, advantages, Principle of working of Hard disk drive, cylinder and clusture, types, capacity, popular brands, standards, interface, jumper setting. Drive components- hard disk platens, and recording media, ,air filter, read write head, head actuator, spindle motor, circuit board, sensor, features like head parking, head positioning, reliability, performances, shock mounting capacity. HDD interface IDE, SCSI-I/2/3 comparative study. Latest trends in interface technology in PC and server HDD interface. g) Precautions to be taken while fitting drives into bays and bay inside PC cabinet. h) CMOS setting.(restrict to drive settings only). i) Meaning and need for using Scan disk and defrag. j) Basic blocks of SMPS, description of sample circuit.		
35-36	***Windows Installation***	Types of software. System software-OS,	Block Diagram, Front and Rear	Problems of binary

	A walkthrough of installing Windows 7 / 8 A walkthrough of installing Windows XP Imaging: create a Windows system image How to Backup/Restore your Windows partition with the bootable image disk Duplicating a partition (creating a multiboot system) A multiboot system: the Windows bootmanager vs. an alternative bootmanager Setting up a multiboot / dualboot system Dual Boot Ubuntu and Windows Windows XP registry tweaks	Compiler. Application software-like MS office. High level, low level language, Computer application scientific industrial and business. Functions of an operating system. Disk operating system. a) . Concept of GUI, Modes of starting on different occasions. b) Desktop, Icon, selecting, choosing, drag and drop. c) My computer, network neighbourhood/ network places. d) Recycle bin, briefcase, task bar, start menu, tool bar, and menus. e)Windows Explorer. f) Properties of files and folders. g) Executing application programs. h) Properties of connected devices. i) Applications under windows accessories. j) Windows Help. k) Finding files, folders, computers. l) Control panel. Installed devices and properties.	view of a monitor,.	addition, decimal to binary, binary to decimal, decimal to hexadecimal, hexadecimal to decimal.
37	***<u>Data Backup</u>*** • 3 types of media to use when backing up your data, and when each method is appropriate • How to create automated backups to ensure you always have a recent backup	Utilities for recovering data from defective/bad hard disks. a) Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM	Connections of a Computer	Binary addition and subtraction.

	• Learn how to manually backup data • How to make an exact copy (clone) of a hard drive ***Hardware Troubleshooting*** • The danger in not diagnosing problems first • Learn how to test your RAM • Check your hard drive for errors ***PC Cleaning*** • The best cleaning supplies to use • How to increase airflow and increase your computer's lifespan • How to clean your computer	drives. b) CD ROM drives- Technology, Types of CD drives, working principle application. c) Technology, working principle, capacity, media of DAT Drive and back-up procedures. d) Technology, working principle, capacity, media of DVD ROM drive . e) Technology, working principle, capacity, media of CD WRITER and use different modes of writing on a CD. Using of utility for CD writing.		
38	***Hard Drives*** • Partitioning hard disk (primary and extended partitions) • Hard Drive Failures • How To Troubleshoot a Noisy Hard Drive • How to Format a Hard Drive • How to Completely Erase a Hard Disk Drive • Installation and configuration of storage devices. Integration of PATA and SATA drivers. • Recover emails, files, and data from a crashed hard drive or computer ***Virus Removal*** • How to run a full system	• What's Inside a Hard Drive? • How Hard Disks Work • Inside: Hard Drive Motherboard • Desktop Hard Drive Buyer's Guide • What is RAID? Using Multiple Hard Drives for Performance and Reliability • Partitioning hard disk (primary and extended partitions) • Learn how to prevent your PC from getting malware • All the different types of malware and how they attack your PC	Diagram of a Hard disk, diagram of internal components and structure.	Calculation of Hard disk capacity, Read /write time, latency time, seek time.

	scan • How to fix your browser from redirecting to other websites (browser hijack) • Using a modern anti-virus utility • When utilities don't fix everything, how to manually remove a virus • 2 specific things to disable when trying to get rid of a nasty virus • 2 special utilities that work wonders	The difference between Anti-Virus and Anti-Spyware software		
39	***System Utilities*** • How to check to see if your hard drive has bad sectors • Fix the master boot record • How to run an in-place installation • Using Task manager and Event Viewer • Using System Monitor and Performance Logs • Configure config.sys file. ***User Account Customization*** • How to create and configure user accounts in Windows XP,Vista,7/8 • Make Changes to an Account • Changing the storage location of the personal folders • Changing the storage location of installed software • Setting up Parental Controls in Windows XP,Vista,7, 8 • How to Use Fast User Switching in Windows • View Hidden Files and Folders • Lock Down Windows 7 / 8 With User Account Control	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.	Pin diagram and block diagram of RAM, ROM, EPROM, Dynamic ROM Chips.	Definition of Scalar and Vector, notations.

	• How to Delete User Accounts in Windows			
40	***Windows Update & Device Driver*** • How to find your system version in Windows, Linux • Installing a service pack • How to perform a Windows Update ***Software Installation*** • Installing a software program in windows • How to run a file from MS-DOS • Extracting or uncompressing a compressed file • How to compress or make files into one file • Extracting files from the Windows cabinets • Uninstalling Windows software • Unable to remove a program from Windows Add/Remove programs	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. Awareness of legal aspects of using computers such as copyright, patent etc.	Diagram of servo motor and stepper motor with external connections	Addition and subtraction of vectors.
41	***Installing Hardware Drivers*** • How To Update Drivers in Windows • How To Roll Back a Driver in Windows • Familiarization with Device manager. • Interfacing with cellphone, tablet PC, synchronization of contacts. ***Windows Utilities*** • How to Repair Corrupted Files Problems • How to check for corrupted files • Restore your machine back to normal	• 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.	Top view of a motherboard showing chip set and slots etc.	Scalar and cross product. Simple problems

	• Hard disk is filling up, what should one do? • Where's the disk space ? • Top 15 Ways to Speed Up the Computer • How to Automatically Clean and Organize the Desktop, Downloads, and Other Folders • 5 Simple Rules To Keep Files Organized • 5 Reasons - Computer Is Running Slow			
42	***Junk File Removal*** • How to Remove Junk Files • How to completely remove "deleted" files • How to clear web browser cache firefox, ie, chrome, • 5 steps to clean up your computer files • Personalize your Windows XP-based PC ***Linux OS*** • Using a Linux Live CD • Why you want a Linux Live CD • Use Ubuntu Live CD to Backup Files from Your Dead Windows Computer • Using a liveCD as your Linux Desktop ***Outlook Configure & Backup*** • Configure outlook • Backup and Restore Outlook • How to restore the Outlook default installation, toolbars and settings • Restore Deleted Items from an Outlook PST-file	Junk files, deleted files, configuration of internet 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	Diagram of different connectors, CPU sockets.	AC circuits: Power, VA, KVA, Watts, KW, related exercise, power factor.

		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.		
43	***Laptop PCs :*** • Identification of laptop sections and connectors. • Assembling and disassembling a Laptop. • Checking of various parts of a laptop. • Checking of batteries and adaptors. • 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. • Laptop troubleshooting • Latest Tools & Gadgets For Desktop/Laptop Repairs	• 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, Configuring wireless internet in a laptop, • Latest Tools & Gadgets For Desktop/Laptop Repairs	Front and Rear view of a Laptop PC.	Diodes: Rectifier, peak voltage, PIV, Rectifier efficiency.
44-45	***SMPS*** a) Remove the SMPS from PC cabinet. Identify the types of output connectors of SMPS. b) Identify output voltages using colour coding. Measure voltage levels. Test power cable and fuse.	a) 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) b) Colour coding adopted. Types of connectors used. Output voltage	Block diagram of SMPS and diagram of various power connectors. 3 d view of SMPS	Specifications and Rating of SMPS. Power Good.

	c) Open and cleaning the cooling fan and other parts. d) Fix the SMPS inside the PC cabinet and test PC. Use Of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool.	levels. Measuring technique. c) Precautions to be taken while cleaning the internal area of SMPS. d) Precautions to be taken while fixing the SMPS inside the cabinet.		
46-47	***MotherBoard / System board*** a) Remove the mother board from PC cabinet. Identify the main components on the mother board. b) Identify the form factor of the mother board. c) Identify the chipset used. d) Identify the number of slots available for add-in cards (ISA, PCI, AGP). e) Identify the type of processor connector(slot/socket/dual). f) Identify the BIOS ROM, make, version. g) Identify the jumper settings(if any) on the mother board. h) Identify the types of slots available for memory modules. i) Identify the connectors for Hard disk(IDE) j) Identify the connector for FDD k) Identify the connector for COMl, Com2. l) Identify the connectors for PS/2. m) Identify the connectors for USB.	a) Mother board function, types, Main components on the mother board and their interconnection. Functional description of mother board, specification and variation. Precautions to be taken before removing the mother board from PC cabinet.. b) Form factor of mother board. c) Meaning and function of chips sets. Manufacturers, comparison, importance of quality chip set for performance of PC. d) Bus standards-evolution, speed, latest trends (ISA, PCI, AGP, new trends). e) Types of processor connectors, examples of latest processor connectors,	Top view of a mother board showing chip set and slots etc Diagram of different connectors, CPU sockets	Interpersonal relation ship and group behaviours.

	n) Identify the connectors for Game port. o) Identify the connector for parallel port(Centronics). p) Identify the connector for Keyboard(in exclusively available) q) Identify the specifications of the Lithium battery. r) Identify any other special component available on the mother board. s) Identify the connectors for front panel switches and display.	number of pins. f) Function of BIOS, manufacturers of BIOS. g) IDE ports available. Primary, secondary. Number of drives that can be connected. Methods of adding SCSI drives. h) Details of FDD connector on mother board. i) Facility for serial Communication ports on mother board. j) Facility for PS/2 Communication ports on mother board. k) Meaning and advantage of USB ports. Facility for USB Communication ports on mother board. l) Facility for game ports on mother board. m) Facility for parallel Communication port on mother board. n) Type of connectors in which keyboards cab be used, old type full size DIN connector. o) Need of		

		Lithium battery. Its specifications. Replacement procedure. Effect of removing the battery from mother board. p) Other special components available on mother boards such as integrated devices/drivers,		
48	***Possible upgrading / changing components on the mother board.*** a) Replace the weak / dead battery on the mother board. b) Replace/upgrade RAM memory modules. c) Replacing/upgrading Processor. d) Carryout Jumper setting on mother board. e) Changing CMOS set-up and setting system level password.	a) 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. Mother board/Chipset/ speed/ connector/power/other compatibility criteria for upgrading processor. Precautions to be taken while removing	- Do -	Dynamic and Static RAM. Quality control standard and institutions.

		and placing processor in sockets and slots. d) Types of jumper settings on motherboard. Its functions and effects. e) CMOS set-up features. Need and procedure for changing the CMOS set-up. Updating Flash BIOS.		
49	***Memory*** a) Identification of different types of memory devices. b) Identification of memory chips. c) Identification of SIMM and DIMM memory modules, number of pins, type.	a) Memory devices, types & principle of storing. Data organization 4 bit, 8 bit, word. b) Semiconductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic. c) Example of memory chips, pin diagram, pin function of popularly used RAM, EPROM, and EEPROM Chips in PC's.	Pin diagram of RAM, DPROM etc.	Calculation of the capacity of RAM.
50	***Project Work (any one)*** 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.	ITIL V3 Practices for Service Management – Service Management Concepts – Introduction, Service Strategy (SS), Service Design (SD), Service Transition (ST), Service Operations (SO), Continual Service Improvement (CSI).	Diagram related with Project	Calculation & Science related with Project.
51		Root Cause Analysis(RCA) – Definition, Four major steps – Data collection, causal factor charting, root cause identification, recommendation generation and implementation. Root	- Do -	- Do -

		cause map, Root cause summery table. Cause & Effect diagram (fishbone diagram), 5 why's or Gemba Gembutsu.		
52	**EXAMINATION**			

Syllabus for the Trade of

"INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE"

Under CTS

Semester –III ***Duration : 6 months***

Week No.	Practical	Theory	Engineering Drawing	Workshop Cal. & Sc.
53-55	***Linux operating system*** - Installing UNIX / LINUX - Preparing functional system UNIX/LINUX - Adding new users, software, material components - Making back-up copies of the index and files - Dealing with the files and indexes	***Linux operating system*** - Basic Linux commands. - Linux file system, The Shell, Users and file permissions, vi editor, X window system, Filter Commands, Processes, Shell Scripting.	Use of drawing instruments, 'T' square, drawing board, construction of simple figures & solids with dimensions, use of different types of scales in inch & millimeters, lettering numbers & alphabets. Diagram of Linux file system.	Entrepreneurship and financial assistance from financial institutions.
56-58	***Printers & Plotters*** a) Testing front panel controls. Interface pins, cables, measurement of voltages and waveforms. b) Installing a printer and carrying self- test. c) Replacing ribbon in a DMP. d) Refilling ribbon tape of DMP. e) Testing and Rectifying defective cable. f) Removing and cleaning printer head. g) Replacing a new printer head. h) Testing and servicing Printer power supply. i) Changing rollers and other mechanical parts. j) Tracing the control board and identifying defective components. Servicing of control board. k) Replacement of toner	a) Types of printers, Dot Matrix printers laser printer, Ink jet printer, line printer. Block diagram and function of each unit head assembly, carriage, and paper feed mechanism. Front panel controls and interfaces. Pin details of interface port. b) Installation of a printer driver. And self test. c) Ribbon types used. d) Refilling of ribbons. e) Printer cable testing defects, effect and servicing. f) Printer head, types, cleaning procedures. g) Precaution to be taken while removing and replacing printer head assembly. h) Pinter power supply, circuit analysis, defects, servicing.	Block diagram of different types of printers. Showing various functional units	Selection, Estimation of time and spares for servicing jobs.

	cartridge of laser printers. l) Refilling toner cartridge of laser printers. m) Drum cleaning and replacement in of laser printers. n) Testing and servicing Printer power supply of laser printers. o) Changing mechanical parts of laser printers. p) Tracing the control board circuit and identifying defective components. Servicing of control board of laser printers. q) Replacement of ink cartridge of deskjet/inkjet printers. r) Refilling ink cartridge of deskjet/inkjet printers. s) Drum cleaning and replacement in deskjet/inkjet printers.. t) Testing and servicing Printer power supply of deskjet/inkjet printers.. u) Changing mechanical parts of deskjet/inkjet printers.. v) Tracing the control board and identifying defective components. Servicing of control board of deskjet/inkjet printers. w) Connecting and using high speed line printers. x) Replacing spares of line printers. y) Self test procedures in printers. Use of diagnostics software for serving printers.	i) Carriage motor assembly, paper feed assembly, sensors . Procedure for dismantling and replacing mechanical parts. j) Printer control board, circuit, function, probable defects, servicing. k) Working principle of LASER printer. l) Toner cartridge, types, replacing toner cartridges m) Refilling toner cartridges, equipment available for refilling and procedure. n) Printer drum, function, cleaning and replacing procedure. o) Power supply in laser printers, circuit, defects, servicing. p) Mechanical parts and sensors on laser printer, function, replacement procedure. q) Control board(s) in laser printer, circuit diagram, defects and servicing procedure. r) Working principle of INK JET/Deskjet printers. Type of ink used and replacement of ink cartridge. s) Refilling of ink, equipment available, quality of refilled cartridges. t) Printer drum, function, cleaning and replacing procedure. u) Power supply in inkjet printers, circuit, defects, servicing. v) Mechanical parts and sensors on inkjet printer, function. w) Working principle of Plotter and its common faults.		
59-60	***<u>Scanner & MFD</u>*** Scanner – Installtion,	Working principles of Scanner, Barcode Scanner,	Block diagram of different	- Do -

	configuration, using Automatic Document Feeder(ADF), OCR. Barcode Scanner – Installation and configuration. Network Scanner – Installation and configuration. Troubleshooting of Scanner. Multifunction Printer – Installation, Replacing supplies and spares, troubleshooting, Passbook Printer – Installation, calibration, configuration & troubleshooting. Replacement of Supplies and maintenance. Network Printer – Installation and configuration, troubleshooting. How to update the flash of Motherboard, printer, scanner and modem etc.	Network Scanner. Working principles of Multifunction Printer, Passbook printer, High Speed Printer, Line Printer, Network Printer. Print Server.	types of Scanners and MFDs. Showing various functional units	
61-62	***Monitor, display card and driver.*** a) Identify the type of monitor connected to PC. Specifications, front panel controls and settings. b) Identify the specifications of the display driver card installed in the PC. c) Remove the display driver card and identify the main components and connectors on the display driver card. d) Replace the display driver card and re-install. (before practicing this skill set, the already	a) Types of monitor, Monochrome and colour, CGA, EGA, VGA, SVGA, Digital Analogue, interlaced non interlaced. Specifications and comparison of Monitors. Front panel controls brightness, contrast, horizontal and vertical height settings. b) Display cards, bus standards, types CGA, EGA VGA, SVGA, AGP , memory and drivers. Main components and connectors on display cards, display controller IC, RAM	Front and rear view of LCD, TFT monitor and CRT display.	Specification, pixel, resolution, raster scan, polarised and unpolarised light.

	installed driver should be removed from device manager) e) Change the exiting display card with a different card given and install. f) Servicing of monitors, changing fuses, adjusting colors, brightness and contrast. Setting resolution, loading drivers. Checking and replacing components on the PCB. Checking and adjusting LCD Monitors. g) Install, configure and operate LCD Projector. h) Install and Configure Touch Pad.	chips and dual port feature principle of working and use of display memory. Installing display drivers, setting features. e) Information required before changing the display driver card and precautions to be taken while installing a display driver card. LCD and TFT Monitors. Understanding the difference between flat screens and CRT display systems Understanding the displays memory and its effect on quality and performance. Working principle of LCD Projector, its specification, configuration and common faults. Working Principle of Touch Pad.		
63-64	***Sound Card*** a) Identify the specifications of the installed sound card in the PC. b) Identify and adjust the playback and recording properties of sound card/driver. c) Remove the sound card from PC and identify the main components on the card. d) Replace the card and reinstall the sound card and set properties. e) Change the existing sound card with a different card given and install.	a) Specifications of sound card 16/32 bit stereo mono . Frequency response, sound file 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. e) Information and resources required before installation of sound	Diagram of Audio amplifier, audio symbols, connectors.	Audio frequency, decibel, mono, stereo, woofer, subwoofer, tweeter, surround sound, Dolby digital

	f) Connect the speaker and microphone, adjust the controls for better quality sound and testing. g) Interconnect laptop to a multimedia projector and carryout adjustments. h) Replace battery pack in laptops and carryout general maintenance.	card. f) Type of speaker and microphone, frequency response, control adjustments, cable and connectors of speaker. Laptops, advantages, essential difference in construction, additional features, PCMCIA cards. h) General maintenance procedures and replacement of battery..		
65-66	***UPS*** a) Identify the specifications of UPS. b) Switch-on and Switch-off procedure of UPS. c) Measurement of Input/output voltage / current levels, battery charge level. d) Identifying status of UPS from front panel indicators. e) Carryout routine maintenance of battery , battery terminals, loose contacts etc., f) Test UPS as per specification. Verification of back-up time. g) Circuit tracing and fault finding practice. h) Servicing of UPS by simulating more likely faults and systematic approach to identify and rectify them.	a) Block diagram of UPS, Principle of working of offline and on line UPS. b) Role of battery, specification of battery inverter and charging circuit. Procedure for switching on-off inverter/UPS. c) Study of typical working UPS circuit, explanation of each stage involved. Voltage, current , frequency and KVA specifications. d) Controls of different type of UPS: On-line, Off-line, Line interactive etc., Typical circuit blocks. e) Routine maintenance of battery and UPS. f) Back-up time, its dependence on battery, load and its calculations.	Front rear and block diagram of UPS	Industrial Acts. Introduction to trigonometry and ratio.

		g) Possible problems in UPS, fault finding procedures. h) Simulated faults and serving of UPS.		
67-68	***Modem*** Installation and configuration of different types of Modem e.g. DSL, ADSL, Data Card, Dongle etc. ***System Resources*** Practice on setting IRQ, DMA, Memory Address, I/O address, Resource Conflict, Plug & Play. ***Practice on Add on Cards, Cables & Connectors*** (AGP, PCI Express, TV Tuner Card, DVR card, Video Capture, SCSI. USB, NIC, Firewire, Card reader, network storage, Game video card, Camera etc.)	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)	Views of different Cards, cables and connectors.	Bit, Byte, Data transmission it speed and its constraints.
69	***POST Code*** 1) Rectify the serial, parallel and USB problem by reinsertion or replacement. 2) Rectify the printers problem by reinsertion or replacement. 3) Rectify the MODEM problem by reinsertion or replacement. 4) Rectify the windows start-up problem by reinsertion or replacement. 5) Rectify the illegal operational problem by reinsertion or replacement. 6) Rectify the virus protection utility problem by reinsertion or	1) Recognise POST error message code as an indication of a serial, parallel and USB problem. 2) Recognise POST error message code as an indication of a printer's problem. 3) Recognise POST error message code as an indication of a MODEM problem. 4) Recognise POST error message code as an indication of a windows start-up problem. 5) Recognise POST error message code as an indication of an illegal operational problem. 6) Recognise POST error	Diagram of Different types of Input and Output Devices.	Boolean Algebra.

	replacement. 7) Rectify the networks problem by reinsertion or replacement. 8) Rectify the external devises problem by reinsertion or replacement.	message code as an indication of a virus protection utility problem. 7) Recognise POST error message code as an indication of a networks problem. 8) Recognise POST error message code as an indication of an external devises problem.		
70-71	***Upgrading of System*** :- Mother board, Memory, CPU, Graphic Card, BIOS upgradation, Additional features, Updating of System Software & Application Software (Requirement & How to update) ***Practice on Back up Drives:*** Pen Drive U3 format, Zip Drive, Tape Drive, USB External Drive (HDD, CD/D VD writer), Types, capacity, interface connector, write protection, Trouble Shooting, Interface, Installation, casing for external drive.	Understand the limitation of a PC and scope for upgrading. Understand technical specifications for PC upgrading. a) Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives. b) Minor repairs and maintenance of CD ROM drives. c) Technology, working principle, capacity, media of ZIP drives. d) Important parts and functions of a ZIP drive. e) Minor repairs and maintenance of ZIP drive. f) Important parts and functions of DAT drive. g) Minor repairs and maintenance of DAT drive. h) Important parts and functions of DVD ROM drive. i) Minor repair works on a DVD	- Do -	Corrective Maintenance, Customised Maintenance, Enhancement Maintenance, Preventive Maintenance.

		ROM drive. j) Minor repair works on a CD WRITER. k) Technology, working principle, capacity, media of Magneto- Optical Disk (MOD) drives. Applications. l) Important parts and functions of MOD drive. m) Minor repair works on MOD. n) Latest trends in backup devices / media.		
72-73	***<u>Maintenance and Troubleshooting of PC.</u>*** a) Running diagnostics program to identify the health and defects of a PC. Check system performance using third party utilities. Use benchmarking utilities to benchmark systems. b) 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. c) Tracing the circuit of a KB. d) Trouble shooting defects related to Keyboard and its related ports ports loose connections, replacing cable, replacing keys (DIN,PS/2,USB). e) Trouble shooting defects related to Mouse and its related ports loose connections, replacing cable,	a) Safety precautions in handling PC, sub assemblies and components, Important points to be considered while purchasing and replacing components. Concept of Preventive and corrective maintenance. Tools required, Active & Passive Maintenance, Maintenance scheduling. Need of diagnostics program. Features, limitations. Examples of commonly used diagnostic programs. b) 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/replacement. c) Block diagram of a KB, function of	- Do -	Handling e-Wastage. Problems on Mensuration.

	replacing roller and sensing elements. (COM,PS/2,USB). f) Study of interface cable connector, replacing of subassemblies of Light pen, scanner, digitizer g) Trouble shooting defects related to HDD,(practice of replacing motor, head, PCB among faulty drives) cable and connector. h) Trouble shooting defects related to CD ROM Drive, Attempting for replacement and adjustments) cable and connector. i) Trouble shooting defects related Ports to Jumper setting. j) Trouble shooting defects related to Processor. k) Trouble shooting defects related to RAM memory modules. l) Trouble shooting defects related BIOS. m) Trouble shooting defects related to CMOS setup. n) Trouble shooting defects related to Battery.	controller, LED driver Sample circuit d) Defects related to Keyboard and its related ports(DIN,PS/2,USB) Discontinuity in cable, and bad keys. Servicing procedure. e) Defects related to Mouse and its related ports(COM,PS/2,USB) and servicing procedure. f) Working principle, electro mechanical circuits of Light pen scanner and digitizer. g) Defects and symptoms related to HDD and its cable, connector and servicing procedure. h) Defects related to CD ROM Drive jamming of mechanical assembly mal function of control circuit. and its cable, connector and servicing procedure. i) Defects related to Ports jumper setting on mother board and servicing procedure. j) Defects related to processor, its socket, cooling and servicing procedure k) Defects related to RAM memory module connector and servicing procedure. l) Defects related to BIOS, upgrading and servicing		

		procedure. m) Defects related to CMOS, COMS setup and servicing procedure. n) Defects related to battery and servicing procedure.		
74-75	***Tablet / Smart Devices*** • Assembling & disassembling of different types of tablets / Smart Devices. • Testing of various parts with multimeter. • Replacing of faulty parts. • Fault finding & troubleshooting. • Practice Advanced troubleshooting techniques. • Flashing of various brands of tablets / smart devices. • Upgrading operating systems. • Formatting of virus affected devices. • Unlocking of handsets through codes and software. • Troubleshooting settings faults. • Working with iOS, Android, Icecream sandwich, Jellybeans. • Installation of PhoneGap framework.	• 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, Icecream sandwich, jellybeans. • Concept of PhoneGap.	Front and Rear view of Tablet.	Specification of Desktop PC, Laptop, Tablet, Smart Devices. Warranty & Guarantee and their differences.
76	***Internet and Web Browser*** Practice web browsing using popular web browsing software, Configuring web browser. Search for content using popular search engines. Use favourite folder for	***Internet and Web Browser*** World wide web and website Web Browsing and popular web browsing software. Introduction to Search Engines, Popular Search engines.	Block diagram of Internet.	Proprietary and Open Source Items.

	browsing quickly. Downloading & Printing WebPages. 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. Sending document/softcopy by email, activating spell checking, using address book, Handling SPAM, Removal of Cookies. ***Cloud Computing*** Work with Cloud services.	Concept of Favourites Folder. What is an Electronic Mail. Email Addressing, BCC and CC, Inbox, Outbox, Address book, 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.		
77	***Project Work (any one)*** Troubleshoot / Repair / Replace a faulty Printer / Scanner / UPS / MFD / VDU / Add-on card /Spares, Installation & configuration of LINUX, Configure Outlook, Setting / Configuring Tablet / Android etc.		Diagram related with Project	Calculation & Science related with Project.
78	**EXAMINATION**			

Syllabus for the Trade of

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Under CTS

Semester – IV ***Duration : 6 months***

Week No.	Practical	Theory	Engineering Drawing	Workshop Cal. & Sc.
79	***Components of the Computer Network.*** Familiarization with various Network devices, Connectors and Cables. Understanding the Layout of network.	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) and Internet, Ethernet, Wi-Fi, Bluetooth, Mobile Networking, Wire and wireless Networking. Difference between Intranet and Internet.	Block diagram of different types of network and network devices. Block diagram of different network topologies.	Quality control standard and institutions.
80-81	***Crimping & Punching*** Crimping practice with straight and cross CAT 5 cables. Punching practice in IO Box and patch panel. Crimping and making cables.	Communication Media & Connectors – Unshielded twisted-pair (UTP), shielded twisted-pair (STP), Filber Optics and coaxial cable: RJ-45, RJ-11, BNC. Understanding color codes of CAT5 cable. 568A and 568B convention.	Diagram of different Network cables and connectors.	Standards of Cables and connectors.
82	***Cabling*** Create cabling in a lab with HUB/Switch and IO Boxes and patch panel. Fitting Switch Rack.	Introduction to Data Communication – Analog and Digital Signals, Simplex, Half-Duplex and Full-Duplex transmission mode.	Diagram of different tools to setup a computer network.	Calculation of Network Speed. Bandwidth, Baud Rate, Half Duplex and full duplex.
83	***Install & configure a Network.*** Installing & Configuring a Peer-to-Peer Network using Windows Software. Making cables by crimping.	OSI Model - The functions of different layers in OSI model	Diagram of OSI layers.	Layer wise network equipment, accessories and protocols.

	Connect computers using Bluetooth.			
84-85	***Configuration of Data communication equipments.*** Connecting computers with Network with Drop cable and using Wi Fi configuration. Basic Programmable switch Configuration Spanning Tree Protocol (STP) Command Line Interface IP Routing Process Verifying Configuration	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	Diagram of a basic and advanced wi-fi network.	Protocols, transmission and reception process, speed.
86	***IP Addressing & TCP/IP*** IP Addressing technique(IP4/IP6) and Subnetting and Supernetting the network. Installation and Configuration of TCP/IP Protocol. Practice TCP/IP Utilities : PING, IPCONFIG, HOSTNAME, ROUTE, TRACERT etc. Setup and configure a Virtual LAN	Protocols, TCP/IP, FTP, Telnet etc., Theory on Setting IP Address(IP4/IP6) & Subnet Mask, Classes of IP Addressing. Overview of Virtual LAN VLAN Memberships Identifying VLAN Trunking - VLAN Trunk Protocol (VTP) Concept of Translator Gateways.	Diagram of subnet and super net.	IP Addressing and subnetting.
87	***Other Network Protocols*** Working with SMTP, TELNET, FTP, HTTP, SNMP, LDAP etc. Practice on configuring DHCP.	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	Block diagram of different types of internet protocol system.	- Do -
88-89	***Sharing Resource & Internet connection.*** Sharing Resource and Advance Sharing Setting. Installing Proxy Server.	Concept of Internet. Architecture of Internet. DNS Server. Internet Access Techniques, ISPs and	Diagram of distributed networking.	DSL Speed Calculation.

	Exposure and using Internet. Setting E-mail accounts. Conferencing. Installing and Configuring Internet Connection on a PC using Broadband or Dongle.	examples(Broadband/Dialup/Wifi). Concept of Social Networking Sites, Video Calling & Conferencing. Concept of VIRUS and its Protection using Anti Virus, UTM and Firewall.		
90	***Network Protection and troubleshooting.*** Setting up basic protection using public keys and MAC address filters. Integrate wired with wireless network. Power over Ethernet(PoE). Troubleshooting wired and wireless network.	Collaborating using wired and wireless networks, Protecting a Network, Network performance study and enhancement.	Schematic diagram of network models with different configuration	Standards of Wi-fi Network. Antenna and its types.
91	***Control & monitoring of network devices.*** Setting up of basic collaboration tool like NetMeeting for activities like chat, application sharing, remote desktop access and control, VoIP. Setup IP camera for basic surveillance scenario, logging and monitoring of devices / locations.	Surveillance using network devices, collaboration on network for team optimization and support activities. Remote management of devices.	Block Diagram of Surveillance System.	Calculation of cost of hardware devices. Finalization of estimate.
92	***Network Security*** Practice on firewall technologies to secure the network perimeter. Practice LAN security considerations and implement endpoint and Layer 2 security features. Wi-fi configuration to implement security considerations.	***Network Security*** 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.	Various sysmbols of Networking.	Data Encryption and Decryption Techniques.
93-94	***Server Installation & Basic Configuration.*** Identify Server Hardware Install and configure Windows Server Install and Configure Active Directory, Implementing AD Services. Configuration of broadband modem and	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.	Diagram of a Centralised Networking, Client-Server network diagram.	Data communication Techniques. CSMA / CD.

	sharing internet connection.			
95-96	***Install & configure DNS*** Installing and Configuring DNS Services - Setup Name resolution – Host names, NetBIOS names - Installing DNS Server - Configuring DNS Zones, DNS Clients, Delegating Zones - Testing DNS with nslookup, dnscmd and dnslint Installing and Configuring DHCP Services - DHCP Server Configuration - Setting up of DHCP, Routing and remote access.	Concept of DNS. Name resolution – Host names, NetBIOS names. DNS Overview. DHCP Overview DHCP Clients and Leases	Block diagram of WAN.	Concept of Asynchronous & Synchronous Transmission.
97	***Routing and Remote Access*** - Configuring RRAS - VPN implementation - Configuring Remote Access Authentication Protocol - Configuring RRAS Policies - Configuring IAS - Managing TCP/IP Routing	Remote Access Overview VPN Concepts. Remote Access Authentication Protocol RRAS Policies IAS TCP/IP Routing	Front and Rear view of different Data communication equipments.	Concept of Tree and Forest.
98	***Planning and Implementing User and Group Strategies*** - Adding Account - Implement AGDLP Process - Implement User Authentication Strategy - Planning and Implementing OU Structure Planning and Maintaining Group Policies - Configuring User Environment - Configuring Computer Security	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	- Do -	User's Role and Scope.
99	***Server Configuration & Backup*** Configure a server as web	Introduction to Web Server Introduction to Messaging Services	Block diagram of Planning and Maintaining Group Policies.	Specification of a different Server like Database

	server Configuring Mailbox Servers Implementing Backup and Recovery	Concept of Backup and Recovery of Server.		server, File Server, Web Server, Proxy Server etc.
100	***Managing Server Network Security*** - Security Baseline Settings and Templates - Configuring Audit Policy - Monitoring and Troubleshoot Network protocol - Configuring Protocol Security - Planning security for Wireless Network	Security Baseline and Templates Audit Policy Understanding IPSec Protocol Security Planning security for Wireless Network	Security baseline template and diagram of the planning of wired and wireless security.	Security Audit and policy.
101	***Maintaining Network Infrastructure*** - Monitor Network Traffic - Troubleshoot Internet Connectivity - Troubleshoot Server Services - Use Linux Network Tools to check / maintain / Manage Network.	Managing Network Traffic Types of Problems of Internet Connectivity Types and working of Server Services.	- Do -	- Do -
102	***Linux Server installation and configuration*** - Install Linux Server - Create new user and group - Create public and data directory - Create an lmlhosts file - Check host file - Secure and run SWAT - Filter ports - Telnet installation and configuration	Linux Server installation and configuration - Configuration Plan - Public and data directory - Host file - SWAT - Password Authentication - Telnet	Block diagram of Linux directory and file system.	Estimation to setup a client server networking system.
103	***Project Work (any one)*** Setting up a LAN of at least 3 PCs using HUB / Switch and structured cabling, Configuration of Switch / Router, Setup a wireless LAN with security features, Invoking Network security, Installation & configuration windows server, Installation & configuration of LINUX Server etc.		Diagram related with Project	Calculation & Science related with Project.
104	**EXAMINATION**			

TRADE : INFORMATION & COMMUNICATION TECHNOLOGY SYSTEM MAINTENANCE
LIST OF TOOLS AND EQUIPMENT

A. TRAINEES TOOL KIT FOR 20 TRAINEES +1 INSTRUCTOR

Sl.No	Specification	Quantity
1	Connecting screwdriver 100 mm	21 nos.
2	Neon tester 500 V.	21 nos.
3	Screw driver set (set of 5)	21 nos.
4	Insulated combination pliers 150 mm	21 nos.
5	Insulated side cutting pliers 150 mm	21 nos.
6	Long nose pliers 150 mm	21 nos.
7	Soldering iron 25 W. 240 V.	21 nos.
8	Electrician knife	21 nos.
9	Tweezers 100mm	21 nos.
10	Digital Multimeter	21 nos.
11	Soldering Iron Changeable bits 15 W	21 nos.
12	De- soldering pump	21 nos.

B. LIST OF TOOLS REQUIRED

Sl.No	Specification	Quantity
1.	Crimping tool (pliers)	2 Nos.
2.	Soldering Iron 25W	6 Nos.
3.	Magneto spanner set	2 Nos.
4.	Screw driver 150mm	4 Nos.
5.	Steel rule 150mm	2 Nos.
6.	Scriber straight 150mm	2 Nos.
7.	Soldering Iron 240W	1 Nos.
8.	Allen key set (set of 9)	2 Nos.
9.	Tubular box spanner (set of 6nos)	1 No
10.	Magnifying lenses 75mm	3 Nos.
11.	Continuity tester	6 Nos.
12.	Soldering iron 10W	6 Nos.
13.	Cold chisel 20mm	1 No.
14.	Scissors 200mm	1 No.
15.	Handsaw 450mm	1 No.

B. Tools & Equipments

Tools and Equipment: (Computer Hardware: Installation and Maintenance)		
Sl. No.	**Name of the Equipment**	**Qty**
HARDWARE		
1	Server Computer	01 no
3	Desktop Computer	10 nos

4	Laptop, Notebook	01 each
5	Intel Mobile Desktop based PC with LCD monitor	01 no
	Tablet	02 Nos.
6	Printers: Laserjet, deskjet, passbook, mfd	01 each
7	Network Printer	01 no
9	5KVA online UPS	02 nos
10	LAN Cards, Wi-fi LAN Cards	06 nos each.
11	LCD/DLP Projector	01 no
12	Power Meter	02 nos
13	Crimping Tools	06 nos
14	Computer Toolkits	06 Nos.
15	Computer Spares:	As required
16	Motherboards (of different make)	4 nos
17	Cabinets	4 nos
18	Processors (of different make)	4 nos
19	Hard Disk (500 GB or better) different types	4 nos
20	Optical Drives	4 nos
21	LCD/LED/TFT Monitors	2 nos
22	Pen Drives	4 nos
23	External Hard disk	2 nos
24	External DVD Writer	2 nos
25	Keyboards	4 nos
26	Mouse	4 nos
27	Anti static pads	4 nos
28	Anti static wrist wraps	4 nos
29	SMPS	4 nos
30	Digital Multimeters	10 nos
31	Blu-Ray drive and player	2 nos
32	External Hard Disk	2 nos
34	Digital Camera	2 nos
35	HD Display	2 nos
36	Network storage	2 nos
37	Card Reader	2 nos
38	Game video card	2 nos
39	Web Cam	2 nos
40	Surround sound speakers	2 nos
42	Different types of memory cards	2 nos each
43	Laptop kits	12 nos
44	Laptop spares: Cabinet with display, memory, hard disk, battery pack, keyboard membrane, chargers	As required
47	SMPS Trainer kit	2 nos
48	UPS Trainer kit	2 nos
49	Power electronics Trainer kit	2 nos
50	Post error debugging card	4 Nos
51	SMPS Tester	4 Nos.
52	PCI slot Testing tool	4 Nos.

SOFTWARE		
1	Windows Server Operating System	1 license
2	Windows Operating System	2 licenses
3	Linux Operating System	2 nos.
4	Network Management Software	01 No.

5	MS Office	2 nos
6	Anti virus software	2 nos
7	Data recovery software	2 nos
8	LINUX Server Operating System (Samba / Su-se)	01 No.
9	Open source Pc Utility / Tweak Software	As availabe

FURNITURE and Other Equipments		
1	Computer Tables	10 nos
2	Computer Chairs	20 nos
3	Printer Table	1 no
4	Class room chairs	20 nos
5	Air conditioners (optional)	2 nos
6	Scanner	1 no
7	Modem	1 no
8	Telephone Line	1 no
9	Broadband Internet connection	1 no
10	Fire fighting equipments	As required
11	Hardware and Network Trainer Kit	6 nos

C.Tools & Equipments

(Computer Networking)		
Sl. No.	**Name of the Equipment**	**Qty**
HARDWARE		
1.	Wireless Network Adapter	6 nos
2.	Wireless Access Point	4 nos
3.	Router	4 nos
4.	Managed Layer 2 Ethernet Switch 8/16/24 port	2 nos
5.	Managed Layer 3 Ethernet Switch 8/16/24 port	2 nos
6.	Network Training System	2 nos
7.	LAN Protocol Simulation and Analyser Software	2 nos
8.	Network and Internet security trainer	2 nos
9.	LAN cable tester	2 nos
10.	Network cables – UTP	As required
11.	Network Cables – coaxial, flat, ribbon	As required
12.	LAN Cards, wi-fi LAN Card	05 nos each
13.	Connectors for cables	As required
14.	Power Meter	2 nos
15.	Media Convertor	4 each
16.	8/16/24 port UTP jack panel	2 nos
17.	SC Couplers	12 nos
18.	SC Pigtails	12 nos
19.	RJ-45 connector	As required
20.	Fluke Meter	2 nos
21.	Crimping Tools	6 nos
22.	Switch with POE ports	2 nos
23.	POE adapters	2 nos
24.	Network Camera (Outdoor / Indoor)	2 no each
25.	Fibre Optics cable with LC connector	As required

26.	LC connector module	As required.
27.		

Raw materials		
1.	White Board Marker	1 Dozens
2.	Duster Cloth(2' by 2')	20 Pcs
3.	Cleaning Liquid 500 ml	2 Bottles
4.	Xerox Paper (A4)	As required
5.	Full Scape Paper (White)	1 reams
6.	PCB, solder flux etc & electronic components	As required
7.	Wires, cables Plug sockets switches of various types and other consumables	As required
8.	Resistors, Capacitors, Inductors, Diodes, LED, Transistors, Thyristors, ICs etc.	As required
9.	Spare Transformers and power devices required for servicing SMPS	As required
10.	Various types of Button Cells	As required
11.	Dry Cell	As required
12.	Hand Brush	As required
13.	Silicon grease	As required
14.	Heat sink agent	As required
15.	RAM 512 MB	As required
16.	Cartridges for printer	As required
17.	Optical Mouse P/S2 or USB	As required
18.	P/S2 OR USB Key Board	As required
19.	SMPS	As required
20.	CMOS Battery	As required

21.	3 Pin Power Chord	As required
22.	Cat 5/5e/6 cable	300 meters
23.	Flat Cable	100 meters
24.	Stapler Small	2 pcs
25.	Stapler Big	1 pcs
26.	AAA battery for remote	As required
27.	AA battery for clock	As required
28.	8 GB pen drives	4 Nos
29.	CDs	20 Nos
30.	DVDs	10 Nos.
31.	Wall Clock	1 pcs
32.	Anti static pads	As required
33.	Anti static wrist wraps	As required
34.	Soldering wire and paste	As required
35.	RJ – 45 Connector	As required
36.	Telephone cable	As required
37.	Co-axial cable	As required
38.	RJ-11 connector	As required
39.	BNC connector, T connector, terminator	As required
40.	Keystone jack	As required
41.	Patch / Jack Panel	As required
42.	Patch / Mounting cord	As required
43.	RJ-45 Info outlet with faceplate	As required

44.	RJ-45 I/O Box	As required
45.	RJ – 45 Cable extender	As required
46.	8-port HUB	04 Nos.
47.	LAN Card	04 Nos.
48.	Wi-fi LAN Card both PCI and USB	02 Nos.each
49.	Display Card	02 Nos.
50.	USB to RJ-45 converter	08 Nos.
51.	RJ-45 to USB converter	08 Nos.
52.	USB HDD 500 GB	02 Nos.