Syllabus

For the trades of

Information technology & electronics system maintenance

under CTS and ATS

Year - 2005

Revised by

Government of India
Ministry of Labour (D.G.E.&T.)
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN – Block, Sector – V, Salt Lake City,
Kolkata-700091.

List of Members attended Trade Committee Meeting to design the syllabus for the trade of "Information Technology & Electronics System Maintenance" under CTS & ATS

1.	Shri H. Somasundaram	Director, CSTARI, Kolkata	Chairman
2.	Shri Rupak Chatterjee	Sr. Hardware Faculty George Telegraph Trg. Instt. Kolkata	Member
3.	Shri T.Mukhopadhyay,DDT	CSTARI, Kolkata	Member
4.	Shri S. Kant, DDT	CSTARI., Kolkata	Member
5.	Shri P.N.Yadav, DDT	CSTARI, Kolkata	Member
6.	Shri V.K.Saxena, ADT	CSTARI, Kolkata	Member
7.	Shri M.S.Ekambaram, ADT	CSTARI, Kolkata	Member
8.	Shri V.Babu, ADT	CSTARI, Kolkata	Member
9.	Sk.Altaf Hossain, T.O.	ATI, Kolkata	Member
10.	Shri T.K. Das, T.O.	RDAT, Kolkata	Member

List of Members attended the Review Trade Committee Meeting to revise the syllabus for the trade of "Information Technology & Electronics System Maintenance" under CTS & ATS held on 14.12.2005

1.	Shri G. Bhowmik	Director, CSTARI, Kolkata	Chairman
2.	Shri Surajit Ukil	Scientific Officer, ERTL (E) Kolkata	Member
3.	Shri S. Chattopadhy	CETE, Kolkata	Member
4.	P.N.Sanyal	Faculty of Electronics & Telecommunication The George Telegraph Trg. Instt., Kol	Member
5.	Shri D.Bhadury	Technical Officer C-DAC, Kolkata	Member
6.	Shri Asim Sarkar	Technical Officer C-DAC, Kolkata	Member
7.	Shri T.Mukhopadhayay,	Dy. Director of Trg. CSTARI, Kolkata	Member
8.	Shri V.Babu,	ADT, CSTARI, Kolkata	Member
9.	Shri G.Giri,	ADT,RDAT(ER),Kolkata	Member
10.	Shri A.Chakraborty	ADT, CSTARI, Kolkata	Member
11.	Sk. Altaf Hossain	Training Officer, ATI , Kolkata	Member
12.	Shri Mohan Singh.	Training Officer, CSTARI , Kolkata	Member

GENERAL INFORMATION

Craftsmen Training Scheme (CTS) & Apprenticeship Training Scheme (ATS)

1)	Name of the Trade	:	Information Technology & Electronics System Maintenance
2)	Duration of Craftsmen Training	:	2 Years
3)	Entry Qualification	:	Passed 10th Class Examination Under 10+2 System of Education or its equivalent.
4)	Unit size	:	16 Trainees
5)	Space Requirement	:	5 Sq. meter per trainee
6)	Duration of Apprenticeship Training	:	3 Years (including 2 years basic training)
7)	Rebate	:	**a**) 02 Years for NTC holder in the trade of **" Information Technology & Electronics system Maintenance"** issued by NCVT. **b)** 01 year for NTC holder in the trade of **" Electronics Mechanics"** issued by NCVT.
8)	Ratio of Apprentice to Workers	:	1 : 4

SYLLABUS FOR THE TRADE OF "INFORMATION TECHNOLOGY AND ELECTRONICS SYSTEM MAINTENANCE (IT&ESM)" under Craftsman Training Scheme.

Duration : 2 Years

Week No.	THEORY	PRACTICAL
1	Familiarise with Hand Tools, and their uses, Elementary First Aid, General Safety Pre-Cautions	Visit to various labs, First aid Exercises and Fire fighting Procedures
2	Basic Atomic structure, Conductors and Insulators, Electrical Terms and definitions. Resistance, Laws of Resistance and Resistivity. Ohm's law, Series circuit, Parallel circuit, series parallel circuit - their connections and characteristics	Handling and uses of Ammeter, Voltmeter, Ohm meter and Multimeters. Resistance measurement. Verification of Ohm's law, Measure the current, Voltage, Resistance in Series circuit, Parallel Circuit and Series parallel circuits.
3	Types of resistors, Linear and Non linear resistance, Carbon, Wire wound, Carbon film, Metal film resistors, LDR, VDR their characteristics, Variable resistors.	Familiarise with the Log , Linear potentio meters, Wire wound resistors, Find the relation between resistance vs light in LDR, find the relation between resistance vs voltage in VDR.
4	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.	Familiarise with the lead acid battery, Charging of batteries, Series parallel connection of batteries.
5	Magnetism and Electro magnetism. Faraday's law of electromagnetic induction, Self induction, Mutual Induction, Hysterisis curve of magnetic materials.	Measurement of Inductance in various circuits, Flux adding, flux canceling connections.
6	Capacitors, types and constructional details, Laws of capacitance, di - electric strength, capacitors in series and parallel, Variable capacitors, trimmer, padder etc. Charge, RC time constant.	Measurement of capacitance, Capacitors in series, capacitors in parallel. RC time constant.
7	AC fundamentals, series Ac circuit, Inductive reactance, Capacitive reactance, Impedance, Power factor, RC circuit, LC circuit, RLC circuits, Resonance. Single phase ac supply.	Find out the Inductive reactance, Capacitive reactance, Impedance, Power factor in series ac circuits. Measure the power in single phase circuit. Voltage, current, power measurements
8	DC Generator & Motors, Shunt motor, Series motor and compound motors their working and applications Starters used for DC motors.	DC generator characteristics, Connect and start DC motors and change the direction of rotation.

9	Characteristics of DC Motors and their speed control methods.	Speed control of Dc motors- flux control method and armature current control method.
10 &11	DC servo motor, AC servo motor, Stepper motor, Tacho generator and their constructional details, applications and uses.	Familiarise with the connection details and measure the current and voltage in the DC servo motor, AC servo motor, Stepper motor and Tacho generator circuits.
12	Measuring instruments, moving iron, moving coil meters, Ammeter, Voltmeter, Ohm Meter, Watt meter, energy meter their construction and working principles. Extend the range of the meters.	Find the meter resistance and extend the range of the meters. Measure the Power in ac & DC circuit. Measurement of Energy in single phase ac and three phase ac circuits.
13	Transformers, step up, step down, efficiency of transformer, auto transformer, Star and delta connection in transformers	Make star and delta connection with small step-down transformers and measure the voltage in primary and secondary windings.
14	Types of Relays, Switches, Circuit Breakers (MCB, ELCB), Contactors their connections and applications. Soldering and Desoldering.	Connect and check various types of relays, Circuit breakers, Switch gears and contactors Practice on soldering and desoldering.
15	CRO- block diagram, Working principle of CRT, Functions of X-shift, Y-shift controls, Volt/div, time/div controls, Internal triggering and external triggering. Use of CRO for the measurement of AC voltage, DC voltage, time and frequency.	Measure the peak value, peak to peak value, Find out the rms value, measure the DC voltage, Measure the time and find out the frequency using CRO.
16	Semi conductors, Intrinsic and Extrinsic semiconductor, Majority carrier, Minority carrier, P type, N type, PN junction diode, forward characteristics and reverse characteristics. Rectification, Diodes in series and in parallel.	Forward and reverse characteristics of PN junction diode. Diode as a rectifier.
17	Half wave rectifier, Full wave rectifier and bridge rectifier their construction , working and output. Filter circuits, Capacitor input filter, Choke input filter and π Filter.	Measure the voltage and observe the output wave forms of Half wave, Full wave and Bridge rectifier circuits. Measure the output with different filter circuits.
18	Passive filter, Low pass, High pass, Band pass and Band stop filter and their applications, Π type, P type.	Construct and measure the output in Low pass, High pass and Band pass filter circuits.
19	Bi-polar Transistors, PNP, NPN type, Characteristics of transistors, Transistor as an amplifier, Transistor as a switch.	Find and draw the characteristics curves of Bi-polar transistors. Testing of transistors by multimeter.
20	Zener Diode, its characteristics, Voltage regulator, Vari cap diode, Photo diode, LED, Opto-Coupler their construction, working and applications.	Characteristics of Zener Diode, Simple voltage regulator, Characteristics of Varicap, Photo diode and LED.

21	CB,CE, CC configuration of transistors and their characteristics, Voltage gain, current gain, alpha, beta, and impedance.	Characteristics of CE, CC configurations and find their input impedance, Current gain and voltage gain.
22	Biasing of transistors, Voltage divider bias, self bias, emitter feed back bias, Collector feed back bias- their effects and uses & stabilization. Thermal run away in transistors. Basics of PCB, grades, lamination, multi layers PCB.	Assembling of voltage divider biasing circuit, Self bias, auto bias and emitter feed back bias circuits and measure the voltages at base, collector and emitter.
23	Classification of amplifiers, Class A, Class B, Class AB and Class C amplifier their biasing, conduction period and distortion ; applications.	Observe the input and output waveforms in Class A, Class B, Class AB, Class C amplifiers.
24	Coupling of amplifiers, RC coupling, LC coupling, Transformer coupling and Direct Coupling their features and applications. Frequency response.	Construct and measure the gain in two stage RC coupled , LC coupled, Transformer coupled and Direct coupled amplifier.
25	Power amplifier, Single ended, Complementary Push-Pull Power amplifier. IC amplifiers. Fabrication of IC circuits. Voltage gain, Current gain, Power gain in decibels.	Assemble and measure the output power of power amplifier circuits.
26	Speakers and Micro-phones, Dynamic. Types of speakers their sizes, rating and frequency response. Sensitivity and directional properties of various microphones.	Study about the woofer, Mid range, Tweeter and find their frequency response. Familiarise with various types of microphones.
27	Distortion in amplifiers, Amplitude distortion, Phase distortion and frequency distortion. Feed back, Positive feed back, Negative feed back their effects and applications. Voltage feed back and current feed back circuits.	Amplifier with feed back circuits; measure their output with feedback and without feed back.
28	Field Effect transistors, P Channel, N Channel, MOSFET their construction, Characteristics and applications. IC fabrication with MOSFET technology. Handling of CMOS ICs. UJT construction and characteristics.	Assemble and find the voltage gain in FET and MOSFET amplifiers. Find the stand-off ratio of UJT.
29	Power supplies, Simple voltage regulator, Series voltage regulators, Series parallel voltage regulator with short circuit protection, regulation, 3 terminal regulators, variable power supply, Current control in regulators.	Assemble and find the regulation in series regulator, Series parallel regulator, 3 terminal IC regulator, Variable voltage regulator.
30	Oscillators, LC oscillators, Crystal Oscillator. Mono stable, Bistable and Astable Multivibrators. Schmitt trigger. Function generator working principles	Assemble and observe the output of different types of Oscillators, Multivibrators and Schmitt trigger. Operations of Function generator,

	AF, RF signal injector.	AF & RF signal injector.
31	SMPS, Inverters and UPS their working principle and circuit functions.	Circuit tracing and fault finding in SMPS, Inverters and UPS.
32	Operational Amplifier, Inverting amplifier, Non-Inverting Amplifier, Differential Amplifier, Summing amplifier, gain, DC- offset, CMRR. Integrator and Differentiator.	Assemble and measure/observe the output on Inverting Amplifier, Non - Inverting Amplifier, Differential Amplifier, Summing Amplifier, Integrator and Differentiator.
33	Principles of Radio Propagation, Surface propagation, Ionospheric propagation. Amplitude modulation, Side band, LSB, USB, Percentage of modulation, their feature and application. AM detector.	Familiarise with the Audio section and Detector section of AM receiver.
34	Frequency modulation, advantages over Amplitude modulation, FM Detector. FM stereo transmission.	Familiarise with FM receiver and FM stereo receiver.
35	AM receiver, RF amplifier, Local Oscillator, Mixer, IF section - their functions and working. Multi band receiver, FM receiver and AM/FM Receiver.	Fault finding in AM receiver and AM/FM receiver.
36 to 41	Television principles, Scanning and synchronising. Television standards. TV camera, its working principles, VSB transmission. Television systems, Colour camera, TV receiver, Tuner circuit, Channel selector, RF and IF section, AGC, Chroma section, Sync circuits, Vertical section, Horizontal section, AFC, EHT , Auxillary power supply, Sound IF, Audio amplifier, SMPS, System control, Remote control circuit., Video amplifier, OSD, Blanking circuits, Picture tubes, Degaussing, Yoke. Colour systems, PAL, SECAM & NTSC systems.	Familiarisation with the TV receiver controls and their functions. Voltage and waveform measurements in different sections. Familiarise with the monochrome and colour picture tubes- their voltages and connections. Trace the circuits of Various sections of the receiver and find out the signal flow, and power supply. Fault finding procedure related to individual sections of TV receiver.
42 & 43	Satellite Communication, UP link, Down Link, TVRO terminal, Setting up of TVRO terminal, Dish Antenna - its types and applications, LNB, Receivers, Cable TV network and its systems. Line loss, Line amplifiers. DTH systems. VSAT Satellite Communication system, Transponders, UP link and Down Link, S-band, C-band, Ku band.	Setting up of TVRO Terminal and Receive signal of different Satellites. Familiarise with the control room setup of a Cable TV service Provider.
44	Reverse path systems, Reverse path amplifiers, Internet connection through Cable net work	Familiarise with the cable network systems and signal transmission in forward and reverse.

45	Digital Signal and Analog signal, Advantages of digital signals, Number system, Binary, Bit, Byte,Octal, Hexadecimal systems and their conversion, 2' s complement system. Basic Logic gates, AND, OR, NOT gates. Combinational Logic circuits, NAND, NOR, EX-OR, EX-NOR circuits. Timing diagram.	Familiarise with the Logic probe and digital signals. Assemble and verify the truth table for Basic logic gates and Combinational Logic gates.
46	Half adder, Full adder, Half subtractor, Controlled inverter, 2's complement adder/subtractor. Concept of ALU.	Assemble and verify the truth table of Half adder, Full adder, Controlled inverter and 2's complement adder/subtractor.
47	Flip-Flop, RS Flip-Flop, Clock pulse, Edge triggered, D Flip - Flop, JK Flip-flop and JK Master Slave Flip -Flop, T-Flip Flop.	Verify the truth tables of Various Flip -Flop circuits.
48	Registers, Series shift register, Bi-directional series shift register, Parallel shift register, Latch, Serial in-parallel out register, Parallel in-serial out register,	Assemble and observe the output of series shift register, Parallel shift register.
49	Counters, Ripple Up counter, Ripple down counter, Up-Down counter, Parallel counter, Frequency dividers, Decade counter, Modulo N Counter, Ring counter, Jhonson counter.	Verify the output and draw the timing diagrams for various counters. Testing of digital IC's.
50	Display devices, 7 segment format, LED, LCD displays, Dot matrix format, Multiplexing and de-multiplexing. PLL, Open loop and closed loop systems, servo system for various variables.	Familiarise with the display devices, Assembling of digital counter circuits and familiarise with digital multimeter circuits. Study about the servo system - motor position and speed control systems.
51	Computer - Definition, features and applications. Hardware, software, live ware and firm ware. Data, datatypes, physical & logical concepts of data. Information and its characteristics. Representation of information inside a computer. Bit, byte, Kilo Byte, Megabyte and Gigabyte. Generation, Classification and Applications of Computers.	Visit to establishments with general purpose and special purpose computers. Visit to Computer Centres with Mainframe, Mini and micro Computers. Familiarisation with different type of Computers.
52	Block diagram of a Computer System. Standard and common input/output devices. Primary and Secondary Memory. Memories : RAM, ROM PROM, EPROM, EEPROM. Dynamic and Static RAM. Cache Memory. L1 and L2 cache. Concept of Virtual Memory.	Familiarise with the memory chips. Programming the ROMs. Copying PROM, Erasing PROM. Connecting and dismantling cords, cables and peripheral devices. Identifying and handling different types of floppys and CDs.

	Buses - Control bus, Address bus and Data bus.	
53 to 56	Micro processor- Program counter, Stack pointer, Internal address bus, External address bus, Data bus, Registers, ALU, Memory interfacing, I/O interfacing and Interrupt interfacing techniques. DMA Controller. A to D and D to A converters.	Familiarise with the Microprocessors, Address bus, Data Bus. Assembly language programs using 8085 instruction set. Interrupt Interfacing. A / D and D / A converters.
57	Booting - Booting sequence, cold and warm booting. Booting files and their functions. Power On Self Test (POST). Storage and retrieval of data - concept of tracks, sectors, blocks, cylinders. Boot record and Master Boot Record. File Allocation Tables (FATs).	Understanding the keys and their functions in keyboard. Keyboard operation and practicing with mouse. Booting the computer under DOS and Windows.
58	Comparison of DOS & Windows, switching between DOS and Windows. Basic DOS commands for File/Directory manipulations, copying of Files and Disks, Delete and Undelete.	Practice of Basic DOS commands for File/Directory manipulations, copying and moving and File/Directory manipulations.
59	MS Windows - Starting Windows and its operations. File management through Windows Explorer. Display and Sound properties. Screen savers. Font management. Installation of Programs. Settings, using and applications of Control Panel.	Introduction to Windows - The user interface, using mouse, status bar, Start, Menus, Running applications. My Computer, Recycle Bin, Windows Explorer. Creating, Renaming and Moving Files and Folders. Using Help.
60	Applications of essential accessories such as notepad, Wordpad, Paintbrush, Imaging, Calculator, Calendar, Media player and Sounds. Multimedia.	Advanced Windows - Creating shortcuts & Folders. Using Accessories. Adding and removing components of windows. Formatting a floppy.
61	Mother Boards- Form factors, common components, different connectors- FDD, HDD, Power Supply. Different processor sockets - LIF, ZIF etc. Memory Sockets. Busses used - ISA,EISA,PCI & MCA; Motherboard BIOS. Operating Systems - Functions and types. Concept of Timesharing, Multiprocessing and Multiprogramming	Identification of different Buses, Processor sockets and RAM sockets. Resetting CMOS and making front panel connections. Replacing BIOS and Battery. Installing Processors and RAM. Extending RAM. Installation of Operating Systems - DOS, Windows 98/Me and Linux/Unix
62	Expansion cards- different types, their uses and construction. Checking and replacing the cards	Identification, Installing and checking of add-on cards by configuring
63 to 65	Drives - Hard Disk drives, floppy drives and CD Drives. Their types, construction and working. Preparing a HDD, DVD, Pen rive (USB)	Installation of FDD, HDD and CD Drives. Formatting and partitiong the HDD. Configuring as Master and Slave. DVD, Pen Drive (USB)

66	Key board and Mouse- different types, working, and interfacing Ports - Serial & parallel, PS/2 and USB, Game port	Identification and interfacing different type of Keyboards and mouse. Checking and cleaning of Keyboard switches and cables. Servicing of Mouse. Installation of various peripherals in the serial port, parallel port, USB and PS/2
67	Monitors- their working and study the circuit functioning. VGA, SVGA,XVGA and their control cards . AGPs.	Fault finding procedure in monitors. Adjusting the brightness and contrast pots.
68 to 70	Printers- types, servicing, Interfacing of Various printers. Scanners and plotters their types, Interfacing. Concept of Bar Coding and Bar code reader.	Installation, Servicing of Different types of Printers, Scanners, Plotters and Bar code readers. Self Test for Printers.
71 & 72	Multi media - their hard wares and supporting soft wares. Digital Camera, Principle and working, Interface with computers. Image transfer, storage	Installation and setting of Multi media components. Installation of various multimedia softwares. Operation, Interfacing and maintenance of Digital Camera;
74 & 75	Assembling and dismantling of a PC. Configuring the BIOS.	Practice of Assembling and Dismantling a PC. Configuring the BIOS.
76	ACD, VCD, Laser recording, Playback, VCD players & DVD player	Familiarise with the circuits and maintenance of CD/VCD/DVD players.
77	Different types of elephone receiver its function and working, Ringer, Dialler, Audio Circuits. Mini EPABX	Familiarise with the Circuits of the Telephone Receiver. Testing of Receivers. Mini EPABX
78	Cellular phone concepts and its principle, Communication process, metering, SMS, Receiving e-mail Wireless Local Loop (WLL) technology and its application	Servicing and maintenance of Cellular phone hand sets. Familiarise with the base unit and hand set of WLL
79	Data Communication Network – Fundamentals. Data transmission through Telephone systems, Fascimile system, FAX & Scanner its working principle.	Installation, operation and maintenance of FAX machines and Scanners.
80 & 81	Software – concepts of software & Algorithm, Flow chart , Decision tables & Programming techniques. Programming with C & C++	Programming with C & C++, different data types, flow control, data representation.
82 to 85	Networking - its advantages and sytems, topologies, client/Server system, Peer-to-peer systems, LAN, WAN, ISO-OSI Model, Various protocols used for net working, Net work softwares. Ethernet.	Preparation of cables for Networking. Structured Cabling. Installing & Configuring a peer-to-peer network using Windows. Installing & Configuring Windows based Server and setting nodes and print server.

86	Communication Media & Connectors - UTP, STP and co-axial cables. Fibre optic cables and its types. Single mode fibre, Multi mode step index fibre and multi-mode graded index fiber. RJ45, RJ11, BNC.	Installing & Configuring Netware Server and setting nodes and print server.
87	Network Components - Modems, Hub, Router, Gateways, Switch, Bridge, Repeaters etc.	Installation and testing of various Network Components.
88 to 90	Internet & Intranets- Principle, uses, Services, Protocols & Layout. Addressing system. TCP/IP Reference Model - layers & functions.	Installing & configuring Internet & Intranet using PSTN & ISDN.
91 to 94	Simple Mail Transfer Protocol (SMTP), Telnet, File Transfer Protocol (FTP), Hyper Text Transfer Protocol (HTTP), Simple Network Management Protocol (SNMP).	Installation of Mail Server, Web Server, Proxy Server and Database Server. Setting E-mail Accounts.
95	Data communication through Satellite. Digital transmission. Leased line connectivity, WAN. Basic concept of ATM with Architecture, Over view of ISDN, ISDN Channels, user access, ISDN protocols, Broad band concepts.	Familiarise with the digital data transmission for WAN. Visit to establishments installed with WAN and earth stations. Familiarisation with ATM. Familiarisation with ISDN, Broadband.
96 & 97	Video conferencing techniques, Voice mail, Internet Telephony, VOIP.	Setting up the video-conferencing hardware and software. Setting up and configuring the Internet Telephony using VOIP.
98	Concept of E-Commerce. E-governance.	Familiarisation with e-commerce and related sites, Familiarisation with E-governance.
99 to 101	Word processing concepts, and applications. Different menu bars and tool bars of MS Word, file management and print management. Hyper linking. Excel – Worksheet basics, data entry and formulae. Graph and chart wizard. Placing excel sheet, charts in other applications and hyper linking.	<u>MS Office</u> Word – Opening documents, creating documents saving & quitting. Cursor controls, using tool bar, printing documents, formatting. Tabs, indents and table formation and working with tables, font management. Borders and shading, Multiple columns, Merging and mail merge, Graphics and suing wizards and templates, Hyperlinking, sending through internet. Excel – Worksheet basics, data entry and formulae. Moving data in worksheet. Using tool bars and menu bars. Formatting and calculations, printing worksheet, creating multiple work sheets, creating charts, changing chart types, Adding titles, legends and grindlines, colouring charts, printing charts, placing charts

	Power Point – Concepts and application of Power point.	in Word file. Power Point – Creating slides, designing slides, back ground, layout of slides, back ground, layout of slides, editing text/deleting, aligning, making bold, italic and underlining, , changing background colours and designs. Creating auto shape, drawings, clip art, shading, rotating text and pictures, saving, quitting and printing. Making animation effects, viewing slides, making sound effects. Grouping and ungrouping the objects.
102	Exposure to on-going IT projects-Railway Reservation Systems, e-Banking, NICNET, LIBNET, ERNET etc.	Familiarisation with on going IT Projects.
103&104	REVISION & TEST	

WORKSHOP CALCULATION AND SCIENCE FOR THE TRADE OF "IT&ESM" :

Duration : 104 weeks.

Problems related to milli, micro, nano ampere and Kilo, Mega resistance
Find out the internal resistance of the battery, total current, total voltage etc.
Find out the self induced emf, Inductance etc.
Find the total capacitance in Series connection and in parallel connection. RC time constant.
Calculations related to reactance, Impedance, Power factor, Resonance etc.
Problems related to 3phase star, delta circuits, star/delta conversion.
Problems related to DC generators and motors. Find out the speed, flux and current in dc motor circuits.
Problems related to 3 phase induction motor. Calculate the speed, frequency, power factor in alternator circuits. Problems related to power, Energy in single phase and three phase circuits.
Conversion of star / delta, delta/star connections Calculate the safe current in various electrical circuits.
Time, frequency, wave length, rms value, peak value. Calculate the average Dc output in half wave rectifier circuits. Find the average DC in Half, Full wave rectifier circuits with filter and without filter.
Find out the Cut-off frequency in filter circuits.
Calculate Ib, Ic, IE in transistor circuit. Draw load line curves.
Draw the graph Resistance vs Light, Resistance vs Voltage and find the resistance at various values.
Calculation related to Zener Voltage regulator. Find the voltage regulation in various regulator circuits.
Calculation related to alpha and beta gain. Calculation of biasing voltages in different biasing circuits. Calculate gain in various amplifier circuits. Calculate the Voltage gain, Current gain, Power gain in decibel units.
Calculate the filter components for the woofer and Tweeter.

Calculation related to positive feed back and negative feed back in amplifier circuits.
Find the input impedance and output impedance in FET and MOSFET circuits.
Calculate the regulation in different regulator circuits.
Calculate the frequency / time in Oscillators and Multivibrators.
Calculation related to the OP-Amp circuits.
Calculation related to Modulation factor, Side band etc.
Calculation of Centre frequency and frequency deviation. Calculate the Oscillator frequency, RF amplifier frequency in AM receivers and FM receivers.
Calculation of signal loss for various signal frequencies.
Conversion, Decimal to Binary, Octal, Hexa decimal numbers from decimal and vice versa. Addition and subtraction of binary numbers. 2's complement subtraction. Addition and subtraction of Hexa decimal numbers.

Details about Ionosphere layers and their characteristics.

Geo stationery orbits, Satellite and their positions, Longitude, Latitude
Parabolic dish antenna, its focal length, f/d ratio, azimuth alignment.

ENGINEERING DRAWING FOR THE TRADE OF "IT&ESM" :

Duration : 104 weeks.

What is Engineering Drawing ? Free hand sketching of straight lines, rectangles, squares, Polygons, Circles, etc.
Free hand sketching of Tools, Reading of simple drawings and concept of dimensions and dotted lines, chain lines, etc.
Free hand sketching of simple solids with dimensions, Free hand sketch of simple solids viewed perpendicularly to their surface and axes.
Free hand sketch of nuts with dimensions from samples. Circuits and wiring diagrams.
Examples of simple orthographic projection in 1st Angle.
Examples of simple orthographic projection in 3rd Angle.
Familiarisation and sketching the details of components.
Use of drawing Instruments, T- square, Drawing Board, Construction of simple figures and solids with dimensions. Use of different types of scales in Inch & Millimeter.. Lettering, Numbers and Alphabets.
Drawing of various Electrical circuits with B.I.S symbol of circuit, Series and Parallel circuit, Power transformer, Instrument transformer, etc.
Free sketching of Plan & Elevation of simple objects, Hexagonal bar, Square bar, Circular bar, Tapered bar, Hollow bar, etc.
Calculation of area of triangles, Polygons with the aid of trigonometry.
Symbols as per different semi conductor devices, LDR, VDR, Thermister & their use in circuits.
Drawing of A.F. amplifier circuits with six stage & with types of O.P & P.P. Block diagram of an Oscillator. Symbols for different wave shapes- Square saw tooth, sine, triangular, etc.
Drawing of AM & FM modulated wave of various modulation 100 pc, 5 pc, etc.
Exercise on Blue print reading / circuits, Reading of House service connections & small circuits.
Reading and drawing of different stages of Radio receiver circuits.
Free hand sketching of Trade objects.

NB:- Syllabus for the subject of Social Studies has already been approved and is common for all trades.

INFORMATION TECHNOLOGY AND ELECTRONIC SYSTEM MAINTENANCE

Tools & Equipments – for a batch of 16 trainees

Tools:

1. Long Nose Plier - 17 Nos
2. Combination Pliers - 10 Nos
3. Side Cutter - 10 Nos
4. Soldering Iron (25W) - 10 Nos
5. Screw Driver Set - 17 Nos
6. Spanner set - 05 Set
7. Crimping Tool (RJ45) - 04 Nos
8. Bench Vice - 02 Nos
9. File - 03 Nos
10. Desoldering Pump - 10 Nos
11. Neon tester - 17 Nos
12. Hand Drilling Machine motorised –01 No.

EQUIPMENTS

1. Power Supply 0-30 V, 2 Amps - 5 Nos
2. Power Supply 30-0-30 V, 2 Amps - 2 Nos
3. Multi meter Analog - 2 Nos
4. Multimeter Digital - 5 Nos
5. Lead Acid Battery 12V, 60 Ah - 2 Nos
6. Capacitance meter Digital - 1 No
7. DC servo Motor - 1 No
8. AC servo Motor - 1 No
9. Tacho Generator - 1 No
10. CRO 10 MHz, Dual trace - 2 Nos
11. Inverter 500W - 1 No.
12. UPS 2 KVA - 1 No
13. Function Generator - 1 No.
14. AM/FM signal generator - 1 No.
15. RF Signal Generator - 1 No.
16. Colour TV Receiver - 2 Nos
17. TVRO Terminal with LNB and Receiver - 1 Set
18. Cable TV Line Amplifier - 2 Nos
19. Digital IC Trainer Kit - 1 No
20. Microprocessor Trainer Kit 8085 - 1 No
21. VCD Player - 1 No
22. DVD Player - 1 No
23. EPBAX with 5 Nos of Telephone receivers - 1 set
24. FAX Machine - 1 No
25. Multimedia Computer (latest configuration)
26. with MODEM connected in LAN - 9 Nos
27. Terminal Adopter - 1 No
28. Laser Printer - 1 No
29. DeskJet Printer - 1 No
30. Hub – 8 Port - 1 No

31. Cable MODEM	- 2 Nos
32. CD Writer	- 1 No
33. Different Expansion Cards	- 1 each
34. Scanner flatbed	- 1 No.
35. Bar code Reader	- 1 No
36. Cell Phone Receiver	- 1 No.
37. Web Camera	- 1 No
38. Digital Camera	- 1 No
39. WLL Phone set	- 1 No
40. ISDN line	- 1 No.
41. Netware software 10 user license	- 1 No
42. Window based Network software 10 user	- 1 No
43. DOS 6.22 or latest	- 1 No
44. Windows 98/me or latest	- 1 No.
45. Linux operating system	- 1 No.
46. Cable Transmission system	- 1 No.

SYLLABUS FOR THE TRADE OF "INFORMATION TECHNOLOGY AND ELECTRONIC SYSTEM MAINTENANCE" UNDER APPRENTICESHIP TRAINING SCHEME

Period of training : 3 Years

The period of training of this trade is 3 years. The first 2 years training should be same as the practical operations / skill of the two years course for the ITI/ITC trainees of the trade "Information Technology & Electronic System Maintenance" . The remaining period i.e. in 3rd. year the shop floor training would include the operations /skills as per the syllabus for this trade.

NOTE FOR APPRENTICESHIP TRAINING

1. The practical training programme of apprentices under ATS(Apprenticeship Training Scheme) should be as per the facilities available in the Establishment / Industry.
2. The syllabus is divided into two parts-
   i) Common Shop Floor Training of duration 4 months.
   ii) Major Group A- Computer System Maintenance OR Group B- Computer Network related Electronic System Maintenance of duration 8 months

The selection of the major groups either GR. A or GR. B would depend upon the facilities available in the concerned Industry / Establishments

3. At the end of Practical training, an Apprentice shall appear for a final examination to be conducted at Establishment level based on the actual shop floor training received by the Apprentices. This examination shall be comprised of assessment of work diaries maintained by the apprentices and viva-voce to be conducted by an external Examiner (other than official directly responsible for Practical training)

COMMON SHOP FLOOR TRAINING -- DURATION 4 MONTHS

Related Instruction:-

1. PC Architecture.
2. Basic principles of :- Networking, LAN, WAN, Information Security.
3. Different types of O.S. and their installation
4. Principles of Internet, applications, e-mail principles & configurations.
5. Mobile Communication- 3G, Mobile Technology, CDMA Standard.
6. Broadband Technology
7. Overview of virus related problems, their remedy and protective measures(SPAM protection).
8. Various enabled services e.g. e-commerce.
9. IT Act 2005 and regulations.
10. Various communication Protocols- GSM, GPRS, CDMA, WLL, 802.11(Wireless Protocol), Blue tooth, etc.

Practical :-

1. Interfacing a PC with different peripherals in different O.S. environments.
2. Identification and display of signals at critical nodes relevant to troubleshooting.
3. Installing a virtual Network in office environment (V.P.N).

Group A :- COMPUTER SYSTEM MAINTENANCE

(Duration – 8 Months)

I) PRACTICAL TRAINING

List of operation / skills to be learnt during Apprenticeship Training :-

Site Preparation:

Installation and air-conditioning requirement, power requirement, suppression of power supply disturbance (AC ripples, spikes and RF interferences). Power wiring lay outs, stabilizer, different types of servo, CVTs & UPS requirements. Computer installation tests and Software tests.

Servicing of Computer and Peripherals :

1. Mother board: – Checking and installing motherboards with different form factors, on-board feature, processor sockets and memory sockets. Programming and re-setting CMOS a making front panel connections.

2. Expansion Cards : - Identification, checking of installing of different expansion cards commonly used.

3. Power supply :- Linear power supply, switch mode power supply, identification of power supply problems based on out put voltage, load and electrical noise.

4. Drives :- Maintaining, troubleshooting and repairing FDDs, HDDs, CD drives and DVDs.

5. Key board :- Servicing the key boards, troubleshooting of the key board, Checking key signals and cables, replacing key switches and cables.

6. Monitor : - Servicing , Monitors, Identification, of problems with general symptoms - complete dead, contrast/brightness defects, retrace visibility, vertical hold defect, garbage monitors, checking CRT drive card.

7.Printers :- Self test of different Printers – troubleshooting based on symptoms, identifying defective sub-systems(carriage movement, head movement, platen drive, print head, paper seasons, rollers, interfacing) and their rectification.

System Assembling :

Assembling a Computer System, loading the driver software, installing the OS, loading application software and optimizing the system for performance.

Computer Networking :

Installing, configuring and optimizing peer-to-peer and client/Server Networks. Troubleshooting the Networks. Network Administration.

System & Data Security :

Handling different type of viruses, Installing and configuring Anti-virus software. Using data recovery software and recovering data from crashed & corrupted hard disks.

II) RELATED INSTRUCTIONS

Site Preparation :

Installation and air-conditioning requirement, power requirement, suppression of power supply disturbance (AC ripples, spikes and RF interferences). Power wiring lay outs, stabilizer, different types of servo, CVTs & UPS requirements. Computer installation tests and Software tests.

Familiarization with Computer and Peripherals:

1. Mother board: – Familiarization with mother boards with different form factors, on-board feature, processor sockets and memory sockets. Programming and re-setting CMOS a making front pannel connections.
2. Expansion Cards :-Concept of different expansion cards commonly used.
3. Power supply :- Linear power supply, switch mode power supply, identification of power supply problems based on out put voltage, load and electrical noise.
4. Drives :- Different types of drives, e.g. FDD, HDD, CD,& DVD.
5. Key board :- Different types of Key board, cables, & Switches
6. Monitor : - Different types of Monitors, their problems & remedies
7. Printers :- Different types of Printers & their problems and remedies.

Computer Networking : General Principles

System & Data Security : Different type of viruses, Anti-virus software

III) WORKSHOP *CALCULATION & SCIENCE*—

Technical Calculation and Estimating -

1. Review of problems on resistance, current, voltage, capacitance, reactance, Impedance, power factor, resonance frequency, wavelength, rms value, peak value etc.
2. Use of Logarithmic tables for all technical calculations.
3. Trigonometry – Use of trigonometric tables, simple problems in basic trigonometry.
4. Simple calculations on -
   - i) Rating, efficiency etc. of small motors, transformers.
   - ii) Blue print reading
   - iii) Advanced circuit diagrams, their reading and drawing.
   - i) Choice of rectifier, determination of rating etc.
   - ii) Simple LCR circuits, resonance and oscillators etc.
   - iii) Coils, Q. factor, mutual inductance etc
5. Estimating the cost of –
   - i) Domestic electronic equipment
   - ii) Professional electronic equipment
   - iii) Industrial control equipment.

VI) *Engineering Drawing* -

1. Revision of Orthographic Projection (1ST Angle, 3RD Angle), drawing of electrical circuits, symbols for different semiconductor devices, drawing of radio receiver circuits, power tranformer etc.
2. Blue print reading.
3. Advanced circuit diagrams, their reading and drawing.
4. Code of practice for General Engineering Drawing.According to BIS (IS : 696 – 1960)
5. Undertaking of basic tool assembly drawings.
6. Free hand sketching of actual parts of simple electrical and electronic components and communication equipment.

Group B COMPUTER NETWORK RELATED ELECTRONICS SYSTEM MAINTENANCE
(Duration – 8 Months)

I) PRACTICAL TRAININMG

List of operation / skills to be learnt during Apprenticeship Training :-

Familiarization with –

1. **Data Transfer equipments**
   Modems – Internal Modem, External Modem and Cable Modems
   Set top boxes, Line amplifiers, reverse path amplifiers, Distribution amplifiers - their working principle, operation, Installation, maintenance and repairing.

2. **Switches** ATM Switch, Ethernet Switch, Fast Ethernet Switch, FDDI Switch, FDDI/Ethernet Switch, Fiber Channel Switch, Multi service Switch and Routing Switch - their working principle, operation, Installation, maintenance and repairing.

3. **Hubs-** 100VG Hub, ATM Hub, Ethernet Hub, FDDI Hub, Fiber Channel Hub, Repeater Hub, USB Hub, Wireless Hub - their working principle, operation, Installation, maintenance and repairing.

4. **Routers-** ISDN Router, Cable/DSL Routers, Ethernet and ATM WAN Routers, Power supplies for Routers, Router with IP- Voice software, Broad Band Router - their working principle, operation, Installation, maintenance and repairing.

5. **Earth Station** -Fixed and Mobile earth Station, BBP mode/ MSM mode of Operations, High Data Rate Terminal - their working principle, operation, Installation, maintenance and repairing.

6. **ISDN** - NT, Terminal Adopter their working principle, operation, Installation, maintenance and repairing.

7. **UPS** - On-Line, Off- line, Line interactive UPS - their working principle, operation, Installation, maintenance and repairing.

8. **ATM** – Fundamentals of ATM, ATM adaptation layer, virtual paths, and virtual channels. ATM signaling, addressing, NNI, LAN emulation, MPOA, ATM in WAN. Switch designs, traffic management, voice over ATM, and ATM's relationship to DSL.

9. CELL PHONE- Study of the front panel & identification and function of different buttons. Disassembling & assembling of different units & Servicing of Cell phone. Identification of problems, troubleshooting & repairing.

II) RELATED INSTRUCTIONS

Familiarization with –

1. **Data Transfer equipments**
   Modems – Internal Modem, External Modem and Cable Modems
   Set top boxes, Line amplifiers, reverse path amplifiers, Distribution amplifiers - their working principle, operation.
2. **Switches**
   ATM Switch, Ethernet Switch, Fast Ethernet Switch, FDDI Switch, FDDI/Ethernet Switch, Fiber Channel Switch, Multi service Switch and Routing Switch - their working principle, operation.
3. **Hubs**
   100VG Hub, ATM Hub, Ethernet Hub, FDDI Hub, Fiber Channel Hub, Repeater Hub, USB Hub, Wireless Hub - their working principle, operation.
4. **Routers**
   ISDN Router, Cable/DSL Routers, Ethernet and ATM WAN Routers, Power supplies for Routers, Router with IP- Voice software, Broad Band Router - their working principle, operation.
5. **Earth Station**
   Fixed and Mobile earth Station, BBP mode/ MSM mode of Operations, High Data Rate Terminal - their working principle, operation.
6. **ISDN**
   NT, Terminal Adopter their working principle, operation.
7. **UPS**
   On-Line, Off- line, Line interactive UPS - their working principle, operation.
8. **ATM –**
   Fundamentals of ATM, ATM adaptation layer, virtual paths, and virtual channels. ATM signaling, addressing, NNI, LAN emulation, MPOA, ATM in WAN. Switch designs, traffic management, voice over ATM, and ATM's relationship to DSL.
9. **CELL PHONE**- Basic concepts, Types of Cell phones GSM & CDMA, Sim cards features – common & special features. Special effects e.g. Camera facilities, e-mail/ internet management with multimedia effect, interfacing with computers, commonly available service providers.

III) WORKSHOP CALCULATION & SCIENCE—

Technical Calculation and Estimating -

1. Review of problems on resistance, current, voltage, capacitance, reactance, Impedance, power factor, resonance frequency, wavelength, rms value, peak value etc.
2. Use of Logarithmic tables for all technical calculations. 3.
3 Trigonometry – Use of trigonometric tables, simple problems in basic trigonometry.
4. Simple calculations on -
   i) Rating, efficiency etc. of small motors, transformers.
   ii) Blue print reading
   iii) Advanced circuit diagrams, their reading and drawing.
   iv) Choice of rectifier, determination of rating etc.

v) Simple LCR circuits, resonance and oscillators etc.
vi) Coils, Q. factor, mutual inductance etc

5. **Estimating the cost of –**
   i) Domestic electronic equipment
   ii) Professional electronic equipment
   iii) Industrial control equipment.

VI) ***Engineering Drawing*** -

1. Revision of Orthographic Projection (1ST Angle, 3RD Angle), drawing of electrical circuits, symbols for different semiconductor devices, drawing of radio receiver circuits, power tranformer etc.

2. Blue print reading
3. Advanced circuit diagrams, their reading and drawing.
4. Code of practice for General Engineering Drawing. According to BIS (IS : 696 – 1960)
5. Undertaking of basic tool assembly drawings.
6 Free hand sketching of actual parts of simple electrical and electronic components and communication equipment.

NB:- Syllabus for the subject of Social Studies has already been approved and is common for all trades.