Syllabus of
MECHANIC COMPUTER HARDWARE

Under
CRAFTSMEN TRAINING SCHEME

Under the aegis of
NATIONAL COUNCIL OF VOCATIONAL TRAINING

Prepared by
ADVANCED TRAINING INSTITUTE
FOR
ELECTRONICS AND PROCESS INSTRUMENTATION
Ramanthapur, Hyderabad – 500 013

GENERAL INFORMATION

1. Name of the Trade : **MECHANIC COMPUTER HARDWARE**

2. N.C.O. Code No. :

3. Duration of Craftsmen Training : **2** Years (104 Weeks)

       a) Working Hours: (42 Hrs./Week x 104 weeks)

       b) Practical Training: 28 Hrs/week

       c) Theoretical Instruction: 10 Hrs/week, of which,

            i.   Trade Theory: 6 Hrs/week.
            ii. Work shop Calculation and Science: 2 Hrs/week.
            iii. Engineering Drawing: 1 Hr/week.
            iv. Social Studies: 1 Hr/week.

       d) Group study/Discussion,
           Library reference, Seminar: 2 Hrs/week.

       e) Body and Mind training: 2 Hrs/week.

4. Entry Qualification : Passed 10+2 or Intermediate or Pre-university with physics

                    as one of the subject.

5. SPACE NORMS : 5 SQ. MTS PER TRAINEE

OBJECTIVES OF THE TRAINING PROGRAM

On completion of the training, the trained personnel will be able to acquire the following competencies:

1. **Repair and maintain electrical and electronic subsystems associated with PCs and Peripherals.**

2. **Assemble a new PC to given specifications.**

3. **Upgrade, repair and maintain standalone PCs and PC connected in networking environment.**

4. **Install Operating systems and Application packages.**

5. **Repair and maintain common peripherals used with PCs.**

6. **Carryout cabling and install small network environment.**

7. **Set up Laptop computer with multimedia projectors and related devices.**

List of the members of the Expert Trade Committee meeting convened on 28-10-2002 at ATI-EPI, Ramanthapur, Hyderabad, for finalizing the syllabus of "Computer Hardware and Maintenance" to be introduced under Craftsmen Training Scheme:

S.No.	Name & Designation	Organization	Committee
1.	Sri. M.Singa Raju, Director	ATI-EPI, Ramanthapur, Hyderabad-500 013	Chairman
2.	Sri. R.L.Singh, Jt. Director	ATI-EPI, Ramanthapur, Hyderabad-500 013	Member Secretary
3.	Sri. T.M.Rao, Technical Director	N.I.C., A-Block, B.R.K.R. Bhavan,Hyderabad- 500 063.	Member
4.	Dr. K.Satyanarayana, Sr. Manager (HRD),	B.H.E.L., Ramachandrapuram, Hyderabad- 500 032.	-do-
5.	Sri. K.Jagan Mohana Chary, Sr. Engineer	C.M.C.,P.B.No.304,4-3-596/A, Ramkote, Hyderabad - 500 001.	-do-
6.	Sri. S. Raghu Nandan, Senior Manager	(InformationTech. & Telecom Group) E.C.I.L., Post, Hyderabad-500 062.	-do-
7.	Sri. V.Sathiya Sekar, Training Manager	HCL Info Systems Ltd., HCL Towers, 44, Dwarakadas Colony, Chikoti Gardens, Begumpet, Hyderabad	-do-
8.	Smt. M.Kousalya, Scientist F	N.G.R.I., Post Bag No.724, Uppal, Hyderabad-500 007.	-do-
9.	Sri. R.Sujan Prakash, Partner	Jeshta Services, G-12, Ground Floor, Kubera Towers, Narayanaguda, Hyderabad-500 029.	-do-
10.	Sri. T.V.S.Rama Murthy, Jt. Director	ATI-EPI, Ramanthapur, Hyderabad-500 013	-do-
11.	Sri. V.M.Rao, Jt. Director	ATI-EPI, Ramanthapur, Hyderabad-500 013.	-do-
12.	Sri. K.N.Ramachandra Rao, Dy. Director	ATI-EPI, Ramanthapur, Hyderabad-500 013.	-do-

ORGANIZATION OF THE COURSE

WEEK No.	TOPIC /AREA
1	Introduction to the program and institute
2-3	Hand tools and basic fitting
4-6	Introduction to atomic structure and basics of electricity
7-9	Resistors, soldering and de-soldering
10	Primary and secondary batteries
11	Electromagnetism
12-15	AC fundamentals
16	Oscilloscope
17-20	Semiconductor, Diode and rectifier
21-26	Transistors and amplifier
27-28	Power supplies
29	Pulse and wave shaping circuit
30-31	Oscillator
32-33	Mod/ De-mod/ Transmitter
34-35	Special semiconductor
36-37	DC and AC motors
38-42	Digital Electronics
43-47	Microprocessors and semiconductor memory
48-51	Interfacing IO devices
52-53	Revision and Project

54	DOS
55	Introduction to computer
56-57	Windows
58-61	MS office
62-63	Installation of basic I/O devices(Device manager)
64-65	PC cabinet main devices
66-70	FDD, HDD and HDSD
71-72	Monitor (installation and adjustment)
73	Multimedia devices
74-75	SMPS
76-77	UPS
78-81	Mother board and CMOS Setting
82-83	Disassembly and reassembly of system
84-85	Formatting, Partitioning of HD and loading software
86-89	Networking
90-95	Preventive Maintenance and trouble shooting
96-97	Monitor trouble shooting
98-101	Maintenance and trouble shooting with printer
102-103	Revision
104	FINAL EXAMINATION

NOTE:

- SEQUENCE OF TOPICS AND DURATION IS ONLY A GUIDE FOR THE INSTRUCTOR..
- MINOR ADJUTMENT IN SEQUENCY AND DURATION MAY BE CARRIED OUT IF REQUIRED BY THE INSTRUCTOR TO ENSURE OPTIMUM SKILL AND KNOWLEDGE TRANSFER.

SYLLABUS FOR THE TRADE OF "COMPUTER HARDWARE" UNDER CRAFTSMAN TRAINING SCHEME

PERIOD OF TRAINING: TWO Years.

Weeks	Subject/ Topic	Practical	Related Theory	Engineering drawing	Workshop Science and Calculation
1.	Familiarization with the institute. Familiarization with CTS and ATS Schemes and opportunities for employment and further education and training.	a) Video on DGE&T and its schemes. b) Discussion with the Principal and staff members. c) Visits to workshops, labs, office, stores etc., of the institute. d) Demonstration of safety precaution. e) Demo of first aid practice. f) Demo of artificial respiration and practice. g) Demo of electrical safety precautions.	a) Introduction to DGE&T. CTS and ATS schemes of DGE&T. Role of State Directorate. Employment opportunities for ITI pass outs. Opportunity for higher studies for ITI pass outs specially to this trade. b) Punctuality and Discipline expected of trainees. Course duration, methodology and structure of the training program. c) About the institute and infrastructure. d) Safety in moving and shifting heavy and delicate equipments. e) First aid. f) Artificial respiration. g) Electrical safety.	a) Introduction to Engineering drawing, importance and utility. b) List out the workshops, labs visited, their facilities and functions as a first hand writing exercise. c) Free hand sketch of straight lines, rectangles, squires, circles, polygons etc.	a) Study of power distribution system and safety arrangements in workshop and laboratories.

2-3	Hand tools and Basic fitting.	a) Demo on uses of basic hand tools, simple mechanical fixtures. b) Identification of different types of screws, bolts, washers, clamps, rivets, taps, connectors etc. Simple exercises using the above. c) Simple exercise on drilling practice. d) Simple sheet metal works such as bending and riveting. e) Identification and simple exercises using special tools used in electronic trade.	a) Identification, specification and application of basic hand tools. b) Types, specification and application of screws, bolts, washers, clamps, rivets, taps, connectors etc. c) Drills, drilling machines. High speed drilling for PCB's. d) Sheet metals and Bending. e) Special tools used in electronics trade.	a) Reading of simple drawings, its dimension, dotted lines, chain lines etc.	a) Properties of metals used in the making hand tools. b) Use of metals and non-metals most likely to be used in the related trade.
4-6	Introduction to atomic structure and basics of electricity.	a) Identification of conductors, insulators with specification. b) Measure wire gauge using S.W.G /Micrometer. Remove Wire insulation using wire stripper. c) Demonstration of sources of electricity, AC, DC. Basic Electrical appliances using AC, DC. d) Identify specification of types of lamps. Identify specification of types of fuses. Identification and specification of type of switches. e) Identification of meter types and	a) Matter, molecule, atom, electron, proton, neutron, orbit, valency. Classification of matter- conductor, insulator, semi conductors. b) Specification of wires and cables used in electrical and electronic applications. Use of SWG, micrometer. Wire stripping c) Concept of current and voltage. AC, DC Supply indicating lamps. Different types of Fuses and their applications. Different types of	Free hand sketching of circuit component symbols. Free hand sketching of simple circuits.	Calculation of Insulation resistance of different types of PVC material used in electronic industry.

		measuring range. f) Construct a simple circuit using AC/DC supply, lamp, fuse and switch.. g) Measure circuit voltage and current using voltmeters and ammeters. h) Measure voltage and current using Multi-meter (analog-digital). i) Use Multimeter to check fuses, lamps and switches. j) Measure DC and AC power using V-I method and using power meter.	connectors used in electrical and electronic applications. Different types of switches used in electrical and electronic applications. d) Circuit voltage and current. Measuring circuit voltage and current using voltmeters and ammeters. AC and DC meters. e) Measuring instruments, MC, MI type, Ammeter, Voltmeter, Multimeter for measuring voltage and current. Construction, characteristics/features and specification. Digital Multimeter f) Meaning of Circuit and basic electrical circuits. g) Meaning of resistance, continuity and continuity testers. Multimeter for checking continuity. h) Concept of Power and measurement using V&I meter and Power meter.		
7-9	Resistors. Soldering and De-soldering.	a) Identify different types of resistors from physical appearance. b) Identify resistor value and tolerance using colour code.	a) Classification, characteristics and application of different types of resistors.-carbon film, metal film, wire wound,		Decimal addition, subtraction multiplication and division. Conversion of decimals to

		tolerance using colour code. c) Measuring resistance using Multimeter. d) Soldering practice using hook-up wires. Soldering resistors on Tag board. e) Verification of Ohms Law and Kirchhoff's Laws. f) Soldering resistors on PCB. g) De-soldering practice. h) Experiment using P.T.C and NTC resistors. i) Experiment to check VDR's. j) Experiment to check L D R's. k) Test Pots, Presets.	cermet and surface mounted. b) Colour coding of resistors. Calculating /measuring 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 Kirchooff's Laws. f) Printed circuit boards and its application. g) De-soldering tools. h) Temperature dependent resistors and their applications.(PTC and NTC) . i) Voltage dependent resistors (VDR). j) Photoelectric effect, Light Dependent resistors. k) Variable resistors, pots, presets, types and application. Log and Linear resistors.		common fraction and vice versa.

10	Primary and Secondary Batteries.	a) Identification of cell from physical appearance and markings. b) Identifying special types of cells/batteries used in digital watches and calculators. Replacing dead cells in digital watches. c) Measure the voltage of a given cell/battery. d) Measure voltage of primary Cells in series, parallel. Calculate current capacity. Measure voltage of cells in secondary batteries. e) Measure the specific gravity of electrolyte in secondary cells using hydrometer. f) Top-up batteries. g) Recharge battery using a battery charger. h) Carryout general maintenance of secondary batteries.	a) Cells and Batteries. Construction, working and types of Primary and Secondary batteries and their specifications-Voltage, Amp-Hr capacity etc. b) Special types of miniature cells/batteries used in electronic circuits. c) Voltage rating of secondary battery cells and their relationship with the electrolyte. d) Series and parallel connection of batteries and its effect on total voltage and current capacity. Ampere hour of batteries. e) Measurement of Specific gravity of electrolytes. f) Meaning and need for top-up of secondary battery and precautions. g) Battery chargers. h) Maintenance of Secondary batteries.	Free hand sketch of circuits and wiring diagrams.	Reduction of common fraction to decimal fraction. Brief description of manufacturing process of Steel copper, and aluminum.

				Example of simple orthographic projection.	Metric system, metric weight, and metric measurements, units conversion factors. Manufacture of plastic and resins.
11	Electro-magnetism	i) Demo of properties of magnets. j) Direction finding using magnetic needle/compass. k) Magnetizing a magnetic material into a magnet using bar magnet. l) Prepare a solenoid. m) Test /Repair Calling bell and buzzer. n) Test different types of EM relays. o) Experiment on Magnetic Shielding. p) Visit to Electrical section to observe the magnets used in Motors and Generators.	i) Magnetism and its properties. Classification of magnets. Magnetic materials j) Application of magnets. k) Magnetizing magnetic materials. Application of temporary magnets. l) Temporary magnets, Solenoids and its applications. m) Construction and working of Calling bells and Buzzers. n) Construction and working of EM relays and its applications. o) Magnetic shielding and its importance. p) Use of magnets in Motors and Generators.		
12-15	AC Fundamentals	a) Demo of AC and DC waveforms on CRO. Measure Peak, Peak-to-peak, Cycle time, frequency and Demo of induced e.m.f. Calculate RMS and average value. b) Demo of phase relationship between two or more AC signals. c) Measure AC voltage and current. Measure mains AC voltage and	a) Introduction to Alternating current. Parameters of AC wave form and their relationship. Instantaneous, RMS, average value of AC, Cycle and time period b) Meaning of phase and Phase relationship between two or more AC signals. 3 Phase Ac and its uses	Example of simple orthographic projection third angle.	Meaning of enacity, elasticity, malleability, brittleness, hardness, compressibility and ductility with examples.

		identify Phase, Neutral and Ground sockets. d) Visit to nearby generating station.	and its uses. c) Phase, Neutral and Earth in Domestic AC Mains supply. Rules for wiring and hazards due to wrong connections. d) Generation of Electricity. Faraday's Law and EMF equation. induction and induced EMF. Lenz's LAW.		
	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.		The weight of body. Units and shop problem percentage and its application.

	Capacitance and Resonance circuits.	a) Identify of different 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.	a) Working principle of capacitors. Electrostatic action,, dielectric constant. Unit of capacitance and capacitive reactance. Types of Capacitors-electrolytic, ceramic, polyester, tantalum, mica, surface mounted. Colour coding, and tolerance. b) Measuring capacitance and capacitive reactance. c) Behavior of capacitance at different frequencies. d) Capacitors in series and parallel. e) Meaning of Resonance. Application of resonance. Series and parallel resonance circuits	Explanation of simple orthographic projections in third angle. Simple isometric drawings Isometric view of simple objects such as square cube rectangular blocks. Detailed diagram of electromagnets	C.G.S. M.K.S. and their conversion problem. Ratio and proportion shop problems plotting and reading of simple graph works unit of works, energy and power.
16	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.	a) Use of CRO. Oscilloscope block diagram, working 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.	Drawing of Block diagram of CRO, CRT, circuit diagram of oscilloscope.	General condition of equilibrium for series of forces on a body, simple equations of graph.
17-20	Semiconductors, Diodes and Rectifiers.	a) Film on semiconductor, film on PN junction, demo on barrier potential for GE and SI. b) Identify terminals of different types of diodes. Record its specifications referring to diode	a) Semiconductor, intrinsic and extrinsic semi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown	Use of drawing instruments 'T' square, drawing board, construction of simple figures of solids with	Specification gravity balancing examples. Area of rectangle, circle, regular polygons, calculation

		data sheet. c) Plot forward and reverse characteristics of diode Testing working condition of diodes. d) Construct and test a half wave and full wave diode rectifiers. e) Construct and test a Bridge rectifier with and without filter f) Construct a bridge rectifier with capacitance input filter. g) Draw Zener diode characteristics, Simple voltage regulator using zener diode. h) PROJECT : Construct a Bridge rectifier with capacitance input filter	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 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.	dimensions. Use of different types of scales diode in inch, millimeters. Lettering numbers and alphabets.	of area, volume, weight of simple solids, cubes, prism, shop problems.
21-26	Transistor and Amplifiers	a) Identify types 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.	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.	Drawing of electrical circuits with BIS symbols, series and parallel ckt. Power transformer and instrument transformer.	Heat and temperature thermometric scale – Fahrenheit. Centigrade and their conversion, Kelvin Reamer Celsius, meaning of stress, strain, modulus of

15

			Quick testing a transistor-using Multimeter.	Free hand sketching of Plan, elevation of simple object- hexagonal bar, Sq.bar, circular bar, tapered bar, hollow bar etc.	elasticity,. Ultimate strength, B-H curve.
		c) Wire and find the gain of amplifiers in – CB, CE, CC configurations.	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.		Simple problems on lines, angles, triangles and circles. Calculation of area of triangles, polygons with the aid of trigonometry.
		d) Construct and test an AF amplifier in class A and B.			
		e) Construct and test an AF amplifier in Class B mode.			
		f) Construct and test a multistage RC coupled amplifier.	d) Types of Coupling , Multistage amplifiers.		
			e) AF -small signal transistor amplifiers. Class A and B.		
		g) Construct and test a AF power amplifier using of transistors.	f) AF- large signal Amplifiers. Class B, Push-Pull.		
		h) Construct and test a simple class C tuned amplifier.	g) Power amplifiers. Power considerations, and heat sinks.		
			h) Introduction to Class C amplifiers and their applications.		
		i) Identification of IC's and finding its specification using data sheets.	i) Introduction to analog integtated circuits. Types and applications in Audio circuits.		
		j) Construct and test a small signal amplifier using IC.	j) Audio voltage amplifiers using IC's.		
		k) Construct and test a Power amplifier using IC.	k) Audio power amplifiers using IC's.		
		l) Measure noise in amplifiers.	l) Signal to noise ratio, thermal stability in cascaded amplifiers.		
	OP-AMPS and	a) Identification of OP-AMPs and	a) Principle of OP-AMP. Types		

	applications.	finding its specifications referring to data sheets b) Measuring the characteristic features of op-amp. Construct and test inverting, non-inverting dc amplifier using op-amp. c) Construct and test summing amplifier using op-amp. d) Construct and test AF amplifier using op-amp. e) **Project**: Construct and test a 20+20 watt stereo audio amplier using a single IC. (This amplifier should be used with multimedia speaker in later weeks of the training).	and features. b) Characteristics of OP-AMPs. Differential, inverting, non-inverting amplifier, c) Summing amplifier using op-amps. d) AF amplifier using op-amps. Frequency, band-width considerations.		
27-28	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 mains voltage stabilizer for use with	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.	Reading of simple circuits.	Calculation of current voltage in resistive n/w using diode, thermister VDR, LDR.

		TV/Refrigerator. g) Assemble a simple inverter and converter for use with emergency lamp. h) Identify the parts and controls of a UPS. Practice switch-on and switch-off procedures. i) **Project**: Construct a regulated Dc power supply for use with the 20+20 watt audio amplifier constructed in earlier weeks of the training.			
29	Pulse and Wave shaping circuit	a) Construct and test a differentiating circuit b) Construct and test a integrator circuit.	a) Types of waveforms- pulse, sinusoidal, saw tooth, and its representation. b) RC wave shaping circuit circuits-differentiating circuit and its application. c) Integrating circuit and its applications.	Drawing of different wave shaping circuits.	Calculation of RC constant, frequency, calculation in RC oscillators.
30-31	Oscillators	a) Assemble and test a RC oscillator. b) Assemble and test a Hartley oscillator. c) Assemble and test Colpitts oscillator. d) Assemble and test a crystal oscillator. e) Assemble and test a wein-bridge oscillator.	a) Types of oscillators -sinusoidal and non-sinusoidal. Criteria for oscillations. Testing of Oscillators-measurement of frequency, voltage, wave form on CRO b) Working of a Hartley Oscillator, applications and limitations. c) Working of a Colpitts Oscillator, applications and limitations. d) Working of a Crystal Oscillator, applications and limitations. e) Working of a Wein-bridge Oscillator, applications and	Symbols for different semiconductor devices, LDR, VDR, thermistor as in ckts. Block diagram of oscillator, symbols for different wave shapes – sinusoidal, square, saw tooth, triangular	Calculation of frequency, time period from velocity and wave length calculation using MHz, GHz.

			limitations.		
32-33	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. e)	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 a 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 FM signals. f) Pulse modulation – PAM, PWM and PCM. Demodulators. Advantages and applications.	Drawing of AM and FM modulated wave at various modulation 100 pc. 50 pc.	Determination opf velocity ratio, mechanical advantage and efficiency.
	Satellite communication.	a) Visit to a Microwave tower/station.	a) Principle of communication using satellites. b) Types of antennas, directivity and pattern.	Drawing of block diagram of am.fm, microwave link, satellite communication.	
34-35	Special semiconductors	a) Construct and test a JFET amplifier. b) Construct and test a MosFET application circuit. c) Construct and test a relaxation	a) Field effect transistors, types, working principle, applications. b) Working principle and application of UJT. c) Working principle and	Drawing of UJT triggered circuit with ISI symbols, power amplifier circuit, models as SCR,	Problems on mensuration, atmospheric pressure, pressure gauge, absolute

		oscillator using UJT. d) Construct and test an application circuit using SCR. e) Construct and test an application circuit using DIAC. f) Construct and test an application circuit using TRIAC.	application of SCR. d) Working principle and application of TRIAC. e) Working principle and application of DIAC.	DIAC,TRIAC, voltage regulator ckt. Motor control ckt. Remote control by LSI and MSI. Block diagram of microprocessor flow chart of	pressure, properties of matter, the molecules and atoms, difference between mass and weight.
36	DC motors	a) Visit to Electrical Motors section-identification of different types of motors and their specifications. b) Speed control of motors using SCR, DIAC, TRIAC.	a) DC motors – construction, principle of operation , b) Types of speed control, using SCR, DIAC, TRIAC.	DC motors, series and shunt electronic starters.	
37	AC motors	a) Identification types of ac motors, specifications. b) Running of single phase and three-phase ac motors. c) Running of fractional hp motors. d) Running stepper motors.	a) Working principle of ac motors, types of AC motors. b) Construction of single phase and three phase AC motors. c) Fractional hp, capacitor motors. d) Stepper motors..	Solid states power supply circuits.	
38-42	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 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.	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. d) XOR, XNOR gates and application. e) Simplification of Boolean equations. f) Combinational logic circuits. g) Half adder, full adder, parallel	Drawing logic symbols of NOT, OR, NOR, AND, NAND, XOR, XNOR,. Drawing half adder, full adder, decoder, encoder, multiplexer, de-multiplexer, logic symbol of flip-flops, 7-segment display: common anode, common cathode.	Problems of binary addition, decimal to binary, binary to decimal, decimal to hexadecimal, hexadecimal to decimal.

		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.	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.		
43-47	MICROPROCESSOR	a) Familiarization with microprocessor training kit. (Understanding the function of all the sockets and controls) b) Examine and modify contents of registers and memory location in RAM. c) Entering simple program and program execution procedure	a) Introduction to microprocessor, function of microprocessor in computer. b) Meaning and example of 4-bit, 8-bit,16 bit microprocessors. Block diagram of 8085. Functions of blocks. c) Registers and memory. Concept of bus: address bus, data bus,	Block diagram of 8085 MPU	Binary addition and subtraction.

		using single step and run mode. d) Entering programs using data transfer group instructions and executing. Debugging programs. e) Writing simple programs in using arithmetic and logical group instructions, executing. Debugging programs. f) Writing programs using branching and control group instructions, and executing. Debugging programs. g) Identification of different advanced Intel microprocessor chips. h) Identification of different advanced microprocessor chips other than from Intel.	control bus. High level, low level and Machine level languages. d) Instruction set of 8085. Data transfer group of instructions.(MOV,LDA,STA,XI, OUT,IN) e) Arithmetic and logical group of instructions.(ADD,ADC,ADI,SUB,SBB,SBI,SUI,INR,INX,DCR,DCX,ANA,ANI,ORA,ORI,XRA,XRI,CMP,RRC,RLC,CMA,CMC) f) Branching and loop group of instructions. JMP, JNZ, JZ, RET, CONTROL, NOP, HLT) g) Advanced microprocessors used in PCs 8086,8088,80286,80386,80486 and Pentium processor architecture basics. h) Microprocessors from other than INTEL used in PCs.		
	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	Pin diagram and block diagram of RAM, ROM, EPROM, Dynamic ROM Chips.	

| 48-51 | Interfacing I/O devices, Serial interface and Parallel interface. | a) Identifying serial interface connector, pins, cable. Prepare a RS 232C/serial port cable.
b) Experiment with 8085 for serial interface (8051 or relevant) using 1488, 1489 and available serial interface kit.
c) Identifying parallel interface connector, pins, cable. Prepare a Centronics parallel port cable.
d) Experiment with 8085 for parallel interface (8255 or relevant) using available parallel interface kit.
e) Experiment with keyboard interface with keyboard controller chip(using available interface kit).
f) Experiment with display interface.(using available interface kit).
g) Design a memory board for 4/8 bit data and 16 bit address. Change decoder input output for obtaining different addresses read write data into these locations.
h) Working with circuit interface boards using DMA controller, Interrupt controller and timer. | popularly used RAM, EPROM, and EEPROM Chips in PC's.

a) Concept of interfacing I/O devices- mismatch in characteristics and DATA format of devices. Types of data transfer. Serial and parallel- RS 232 and 232C standard voltage drivers 1488 and 1489 Concept of hand shaking.. Brief description of chips used for serial interface such as 8251,16450,16550 etc.,(Restricted to pin diagram and their functions only).
b) Serial interface with tape recorder or any other serial device using 8251 or other relevant serial I/C.
c) Parallel data transfer, parallel port. Brief description of chips used for parallel interface such as 8255 etc.,(Restricted to pin diagram and their functions only).
d) Parallel interface with any parallel device using 8255 or other relevant I/C.
e) Keyboard interface using keyboard interface IC.
f) Display interface using 8279 or relevant IC.
g) Interfacing memory to specific data and address. | | |

			h) Principle of Interrupt and Interrupt controller 8259 pin diagram and function (without internal architecture and programming). Principle of DMA and DMA controller 8237/57 pin diagram and function (without internal architecture and programming). PIT 8253 pin diagram and function.		
52-53		Revision of difficult skills and Project work. Project to be decided under the guidance of the instructor from skills covered under Digital and Microprocessor.	Revision of all topics covered from Week 2 to Week 51		
54	Operating system -DOS.	a) Starting and shutting down a PC. Switching between DOS and WINDOWS mode. b) Use of Internal DOS commands-1. c) Use of Internal DOS commands-2. d) Use of Internal DOS commands-3. e) Use of external DOS commands-1. f) Use of external DOS commands-2. g) Creating DOS rescue disk.	a) Types of software. System software-OS, 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. b) DOS internal commands. c) DOS internal commands. d) DOS internal commands. e) DOS external commands. f) DOS external commands. g) DOS rescue disk.		

				Block dig of personal computer, drawings of keyboard, monitor, mouse, FDD, HDD, floppy disc. CD ROM.	
55	Introduction to computer Hardware.	a) Identify the front panel controls and ports on a PC. b) Identify types of keyboards and connectors/interface. c) Identify types of mouse and connectors/ interface. d) Identify type of display connector/interface. e) Identify type of speaker, Mic connector/interface. f) Identify type of serial and parallel port connectors/interface. g) Connect basic I/O devices(above listed) to PC.	a) Introduction to computers, classification, generations, applications. Basic blocks of a digital computer. Types of I/O devices and ports on a standard PC for connecting I/O devices. b) Function of keyboard, brief principle, types, interfaces, connectors, cable. c) Function of Mouse, brief principle, types, interfaces, connectors, cable. d) Function of monitor, brief principle, resolution, size, types, interfaces, connectors, cable. e) Function of Speakers and Mic, brief principle, types, interfaces, connectors, cable. f) Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable. g) Precaution to be taken while connecting/removing connectors from PC ports. Method of ensuring firm connection.	Block dig of personal computer, drawings of keyboard, monitor, mouse, FDD, HDD, floppy disc. CD ROM.	
56-57	Operating system – WINDOWS 98/2000	a) Starting and shut down. Starting in Safe, DOS mode. b) Setting Desktop and properties. c) Creating files and folders. Opening of files and folders.	a) . Concept of GUI, Modes of starting on different occasions. b) Desktop, Icon, selecting, choosing, drag and drop. c) My computer, network		

25

				Flow charts showing steps in sample programs	

		Deleting files and folders. d) Restoring files, Creating short cuts. e) Working with Explorer. f) Changing file/folder properties. g) Running application programs. h) Identifying properties of connected devices. i) Using applications under accessories of windows program. j) Using help. k) Using find. l) Using windows explorer m) Identifying installed printers and other devices using control panel. Note: The list given above is not exhaustive, instructors to go through any standard book on the windows version being used and make the list exhaustive such that majority of the features of windows other than those used for maintenance are practiced.	neighborhood. d) Recycle bin, briefcase, task bar, start menu, tool bar, 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) Using windows explorer m) Control panel. Installed devices and properties. Note: The list given above is not exhaustive, instructors to go through any standard book on the windows version being used and make the list exhaustive such that majority of the features of windows other than those used for maintenance are practiced.		
58-61	MS Office suit	a) Creating and saving document files using MS WORD. 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.	a) Introduction to word processing and comparison of features. Creating and saving document files using MS WORD. b) Formatting test and editing. c) Setting page and margins. Tabs and indents. d) Creating multicolumn documents. e) Inserting pictures in	Flow charts showing steps in sample programs	

		h) Saving word documents in other formats. i) Mail merge. j) Printing documents. k) Creating Worksheets using EXCEL. l) Formatting cells. m) Using formula in cells. n) Creating simple spreadsheet for an application. o) Creating relation between sheets. p) Graphs and tables in Excel. q) Advanced features in Excel. r) Printing spread sheets. s) Creating slides using POWER POINT. t) Including text and formatting text in slides. u) Slide layout and colour scheme. v) Design template and master slides. w) Inserting pictures and movies. x) Creating slide transition, animation. y) Recording presentation with voice presentation. z) Creating data base tables using ACCESS. aa) Entering and editing data. bb) Creating queries. cc) Creating data entry forms. dd) Working with forms. ee) Creating reports.	documents. f) Creating tables. g) Creating different types of documents. h) Saving word documents in other formats. i) Mail merge. j) Printing documents. k) Introduction to spread sheet. Creating Worksheets using EXCEL l) Formatting cells. m) Using formula in cells. n) Creating simple spreadsheet for an application. o) Creating relation between sheets. p) Graphs and tables in Excel. q) Advanced features in Excel. r) Printing spread sheets. s) Introduction to multimedia slide presentations. Creating slides using POWER POINT. t) Including text and formatting text in slides. u) Slide layout and colour scheme. v) Design template and master slides. w) Inserting pictures and movies. x) Creating slide transition, animation. y) Recording presentation with voice presentation.		

			z) Introduction to database and database management. Creating data base tables using MS ACCESS. aa) Entering and editing data. bb) Creating queries. cc) Creating data entry forms. dd) Working with forms. ee) Creating reports.		
62-63	Installation of basic I/O devices.	a) Create DOS utility and Windows start-up diskette. b) Install a given mouse. Set properties of mouse and cursor. c) Install a given multimedia keyboard and test features. d) Set the resolution and other features of monitor.	a) Reviving a faulty computer. Need of DOS rescue, Windows startup diskette. b) Mouse interface, Drivers, properties. c) Keyboard interface, drivers, features of multimedia keyboards. d) Types of monitors, standards, sizes, resolution, interface, properties, features.	Front and Rear view of a PC	
64-65	PC cabinet, main devices, connectors and cables inside a PC.	a) Opening and closing a given PC cabinet. b) Identifying the devices/components/cards/boards inside a PC. c) Identifying the cables and connectors inside a PC. d) Disconnecting and reconnecting the internal cables of a PC.	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.		
66-70	FDD and HDD AND HDSD	a) Identify FDD connector, jumpers, sensing slots. b) Dismantle a bad FDD and identify inner mechanical and electronic circuit. c) Carryout minor repairs and cleaning of FDD. d) Disconnect cables and remove the 3.5" and 5.5" drive bays from inside PC. e) Remove floppy drive from drive bay and identify specifications. f) Remove one or more hard disks fitted into the drive bay. Check specifications, jumper settings. Study of internal components of HDD with the help of non working HDD. g) Refit drives into the drive bay and fix the drive bay inside PC. Connect back cables to drives. Test system working. h) Identifying, enabling/ disabling/ changing features of drives using CMOS setup. i) Using scan disk and defrag to clean-up drives. j) Recovering data from drives using windows/third party utilities. (use a bad hard disk for practicing this skill).	a) Floppy disk drive. Types of floppy disk drive 1.2 Mb, 1.44 Mb. Trends in higher capacity FDD's. Edge connectors, pin detail, jumper setting, floppy disk, storage capacity, b) Concept of track, sector, cylinder. FD Drive components- read write head, head actuator, spindle motor, sensors, PCB. c) Precaution and care to be taken while dismantling Drives. d) Drive bay, sizes, types of drives that can be fitted. Precautions to be taken while removing drive bay from PC. e) Principle of working of Floppy disk drive, types, media, capacity, popular manufacturers, cost, possible errors, remedial measures. 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-1/2/3 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) Utilities for recovering data from defective/bad hard disks.		
	High Density Storage devices	a) Identification of different types of bulk storage device. b) Dismantle and identify the parts of a CD ROM drive. c) Carryout minor repairs and maintenance of CD ROM drives. d) Install ZIP drive and back-up data on ZIP media. e) Dismantle and identify the parts of a ZIP drive. f) Carryout minor repairs and maintenance of ZIP drive. g) Install DAT Drive and back-up data. h) Dismantle and identify the parts of a DAT drive. i) Carryout minor repairs and maintenance of DAT drive.	a) Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives. b) CD ROM drives- Technology, Types of CD drives, working principle application. c) Minor repairs and maintenance of CD ROM drives. d) Technology, working principle, capacity, media of ZIP drives. e) Important parts and functions of a ZIP drive. f) Minor repairs and maintenance of ZIP drive. g) Technology, working principle, capacity, media of DAT Drive		

		j) Install a DVD ROM drive and test working. k) Dismantle a DVD ROM drive and identify parts. l) Carryout minor repair works on a DVD ROM drive. m) Install a CD WRITER and use different modes of writing on a CD using the supplied utility. n) Dismantle CD Writer and identify parts of CD writer. o) Carryout minor repair works on a CD WRITER. p) Install a MOD and back-up data. q) Dismantle a MOD and identify parts. r) Carryout minor repair works on MOD.	and back-up procedures. h) Important parts and functions of DAT drive. i) Minor repairs and maintenance of DAT drive. j) Technology, working principle, capacity, media of DVD ROM drive . k) Important parts and functions of DVD ROM drive. l) Minor repair works on a DVD ROM drive. m) Technology, working principle, capacity, media of CD WRITER and use different modes of writing on a CD. Using of utility for CD writing. n) Minor repair works on a CD WRITER. o) Technology, working principle, capacity, media of Magneto-Optical Disk (MOD) drives. Applications. p) Important parts and functions of MOD drive. q) Minor repair works on MOD. r) Latest trends in backup devices/media.	
71-72	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.	a) Types of monitor, Monochrome and colour, CGA, EGA, VGA, SVGA, Digital Analogue, interlaced non interlaced. Specifications and comparison of Monitors. Front panel controls	Block Diagram of a monitor diagram of servo motor and stepper motor with external connections

		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 installed driver should be removed from device manager) e) Change the exiting display card with a different card given and install.	brightness, contrast, horizontal and vertical height settings. b) Display cards, bus standards, types CGA, EGA VGA, SVGA, AGP , memory and drivers. c) Main components and connectors on display cards, display controller IC, RAM chips and dual port feature principle of working and use of display memory. d) 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.			
73	Multimedia-Installation of 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. f) Connect the speaker and microphone, adjust the controls for better quality sound and testing.	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. b) Installation procedure of sound cards. Setting playback and recording features. c) Main components on a sound card and its working. d) Properties and specification of sound cards. e) Information and resources required before installation of			Team work and Team building.

32

		g) Interconnect laptop to a multimedia projector and carryout adjustments. h) Replace battery pack in laptops and carryout general maintenance.	sound card. f) Type of speaker and microphone, frequency response, control adjustments, cable and connectors of speaker. g) Laptops, advantages, essential difference in construction, additional features, PCMCIA cards. h) General maintenance procedures and replacement of battery..		
74-75	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. c) Open and cleaning the cooling fan and other parts. d) Fix the SMPS inside the PC cabinet and test PC.	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 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.	Block diagram of SMPS and dia of various power connectors. 3 d view if SMPS	
76-77	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.	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	Front rear and block diagram of UPS	Interpersonal relation ship and group behaviors.

		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.	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. g) Possible problems in UPS, fault finding procedures. h) Simulated faults and serving of UPS.		
78-81	Mother board/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.	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,	Top view of a mother board showing chip set and slots etc Diagram of different connectors, CPU sockets	Industrial Acts.

		i) Identify the connectors for Hard disk(IDE) j) Identify the connector for FDD k) Identify the connector for COM1, Com2. l) Identify the connectors for PS/2. m) Identify the connectors for USB. 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.	examples of latest processor connectors, 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,		

			etc.,		
	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.	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. b) Organization of RAM, types of RAM's, Module types, pins, replacement procedure and precautions. Compatibility of memory modules to the motherboard. c) Type of processors, generation, features, speed, popular manufacturers. Advantages and possibility of upgrading Processor of a PC. Mother board/Chip set/speed/connector/power/other compatibility criteria for upgrading processor. Precautions to be taken while removing and placing processor in sockets and slots. d) Types of jumper settings on motherboard. Its functions and effects.		Quality control standard and institutions.
	CMOS setup	a) Changing CMOS set-up and setting system level password.	a) CMOS set-up features. Need and procedure for changing the CMOS set-up. Updating Flash BIOS.		
82-83	Disassembling	a) Disassemble a given PC totally	a) Procedure and precautions to be		

	and reassembling a PC.	following the safety precautions. b) Reassemble the PC and test for its satisfactory performance.	taken while disassembling a PC. b) Procedure and precautions to be taken while reassembling a PC.		
84-85	Formatting and partitioning Hard disk.	a) Format a given hard disk and partition as instructed. b) Adding a second hard disk to PC. c) Adding a SCSI hard disk to PC.	a) Meaning of formatting hard disk. Procedures for formatting. Meaning of hard disk partition, procedure for partitioning hard disk. b) Criteria for adding additional hard-disk, limitations, setting Master-Slave. c) Need of special controller card for adding SCSI hard disks. SCSI standards. Comparison of IDE and SCSI HDD's. Installing Controller card. Procededure for adding, formatting and partitioning SCSI drives.		Customer relationship and handling.
86-89	Networking of computers.(Installation and maintenance)	a) Log into network and access other system resources. b) Share your system drives and folders. Share your printer, scanner to other network users with or without password. c) Share your resources under share level/user level sharing. d) Create users and profiles. e) Resolve problems in shared devices. f) Crimp a UTP cable ends with RJ45 plug. g) Test a given UTP network cable. h) Prepare 50 Ohms termination adaptors for Coax cables.	a) Introduction to networking definitions – LAN, MAN WAN, basic differences. Basic building blocks of a network, server, terminals, workstation, network interface adapter, printers and software, advantages and disadvantages of a network. Logging in / out onto a server, commands used, using printers connected at server and nodes b) Network operating system function simple commands. LAN access – concept of standards, Topology,	Diagram of computer network in different topology.	Self employment schemes promoted by Central, state and other institutions.

| | | i) Solder/Crimp BNC connector at ends of coax RG 58 cable(thinnet).
j) Test a given Coax network cable.
k) Install Conduits and Wall boxes for network cabling.
l) Install RJ 45 outlets.
m) Install a Ethernet HUB and lay cable connections.
n) Install a Network Interface card (NIC) in your PC using automatic detection(Plug & Play).
o) Install NIC card in your PC using non-automatic detection.
p) Check and set NIC hardware configuration.
q) Resolve hardware conflicts.
r) Install Microsoft network client.
s) Install protocol drivers.
t) Configure Names and workgroups.
u) Carryout Network settings in your PC.
v) Use network neighborhood utility for viewing and accessing network resources.
w) Using Net Watcher utility for managing the network.
x) Identifying defective cables, termination and rectifying simple network problems.
y) Installation and connection to Routers.
z) Installation and connection with Switches.
aa) Installation of repeaters and | protocols, network services, file services print services, message services, database services. Sharing system resources.
c) Types of resource sharing, user level, share level.
d) Creating users and profiles.
e) Resolving problem in shared devices.
f) Cables, connectors and standards. UTP cable connections. Crimping.
g) Testing UTP cables.
h) Need of termination in thinnet and preparing termination adaptor.
i) Use of BNC cables and connectors, standards and crimping/soldering BNC connectors to coax cables.
j) Testing coax network cables in a network environment.
k) Installing conduits and wall boxes for LAN wiring.
l) Connectors used with UTP cables, cabling scheme, installing outlets.
m) Installing and connecting Hubs.
n) Network switching devices, functions, network interface cards, Boot ROM, repeater, hub, bridge, router, 8 bit and | | |

		Bridges. bb) Site preparation, deciding location of server and nodes, providing power connection. Planning for routing of power and signal cables. cc) Selecting cable, preparing cables. dd) Preparing patch panel., patch cords, and mounting racks. ee) Laying down cables as planned and test working of system	16 bit , 32 bit cards. types, standards and installation. o) Installing NIC cards using non-automatic detection method. p) Setting NIC hardware configuration. q) Hardware conflicts and resolving conflicts. r) Installing a client under network. s) Installing protocol drivers. t) System ID, concept of workgroup and configuration. u) Network settings on PC. v) Use of network neighborhood utility for viewing and accessing network resources. w) Use of Net Watcher utility for managing the network. x) Rectifying simple network problems. y) Router, its function, installation. z) Switches, layer-2, layer -3 its function and Installation. aa) Repeaters, Bridges, its uses and Installation. bb) Planning a small LAN. Structured and unstructured cabling. cc) Suitability of cable for a LAN and selection criteria. dd) Need of patch panels,		

			mounting racks and patch cords, its preparation. ee) Care and procedure for cable laying. Cable testing. ff) Networking using Fiber optic lines.		
	INTERNET	i) Identify the specifications of the modem card. j) Install Fax/modem card and carryout necessary settings. k) Install ISP provided software and connect to internet. l) Browse web sites. m) Search for required information on internet using search engines. n) Down load free soft wares from web sites. o) Create E-mail ID. p) Send and Receive Email with/without attachments.	i) Modem, Functional block diagram, specifications and working principle Modems applications, connecting to P&T line or between two computers. Types of modems – smart modems radio modems, modem standards. Functional units, types, Data transfer, buffering.. j) Installation of Fax/modem card in PC. k) Need of Internet service providers and getting connected to internet. l) Web sites and active and passive. m) Search engines and method of getting information from website. n) Procedure for down loading software's from web sites. o) Creating Email ID. p) Sending and receiving mails with/without attachments.		
90-95	Maintenance and Trouble shooting of PC.	a) Running diagnostics program to identify the health and defects of a PC. Check system performance using third party utilities. Use	a) Safety precautions in handling PC, sub assemblies and components, Important points to be considered while	Guest Lectures on Latest trend in technology	Selection, Estimation of time and spares for servicing jobs.

	- (Trouble shooting Keyboard and Mouse Light Pen, Digitizer and scanner - Trouble shooting FDD, HDD and CD D - Trouble shooting with RAM BIOS and Motherboard -Trouble shooting with SMPS - Trouble shooting with multimedia and other add-on cards. | 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, 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 FDD replacing head assembly, motor, sensors, PCB, cable and connector. h) Trouble shooting defects related to HDD,(practice of replacing motor, head, PCB among faulty drives) cable and connector. i) Trouble shooting defects related to CD ROM Drive, Attempting for replacement and adjustments)	purchasing and replacing components. Concept of Preventive and corrective 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 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.		

		cable and connector. j) Trouble shooting defects related Ports to Jumper setting. k) Trouble shooting defects related to Processor. l) Trouble shooting defects related to RAM memory modules. m) Trouble shooting defects related BIOS. n) Trouble shooting defects related to CMOS setup. o) Trouble shooting defects related to Battery. p) Circuit tracing of SMPS measurement of voltages and wave forms at test points Trouble shooting defects related to SMPS. q) Trouble shooting defects related to multi media speakers, microphone, its related ports, cables, connectors and drivers. r) Trouble shooting any other devices attached to the computer such as SCSI disk controller, ZIP drive etc.,	g) Defects and symptoms related to FDD and its cable, connector and servicing procedure. h) Defects and symptoms related to HDD and its cable, connector and servicing procedure. i) Defects related to CD ROM Drive jamming of mechanical assembly mal function of control circuit. and its cable, connector and servicing procedure. j) Defects related to Ports jumper setting on mother board and servicing procedure. k) Defects related to processor, its socket, cooling and servicing procedure l) Defects related to RAM memory module connector and servicing procedure. m) Defects related to BIOS, upgrading and servicing procedure. n) Defects related to CMOS, COMS setup and servicing procedure. o) Defects related to battery and servicing procedure.		

				Front rear view block dia gram of monitor	Preparation of test reports, service reports.

			p) Basic blocks of SMPS, description of sample circuit. Defects related to SMPS, its cable, connector and servicing procedure. q) Defects related to multimedia speakers, microphone its cable, connector and servicing procedure. r) Defects related to other devices attached to the computer such as SCSI controller, Zip driver etc., its cables, connectors and servicing procedure.		
		Note: Any other exercise on trouble shooting may be carried out depending on facilities of Institute.			
96-97	Trouble shooting computer monitor.	a) Identification of specifications of monitors, suitability. b) Replacing defective CRT. c) Replacing defective PCBs. d) Replacing LOT. e) Alignment and adjustment of external and internal controls. f) Circuit tracing – vertical and horizontal section, power supply, EHT, and Video section. g) Measurement of voltages and testing monitors with diagnostic tools. h) Identify specification of LCD displays and multimedia projectors. Connecting and testing LCD and multimedia projectors	a) Block diagram of a monitor, function of each block. Types of monitors – monochrome, colour, CGA, EGA, VGA, SVGA, digital analogue interlaced non interlaced, microprocessor based, resolution. High end Graphic cards such as AGP. Specification of monitor comparison of monitors. b) CRTs used in monitors, specifications, test procedure, servicing. c) Function of LOT, test procedure, replacement procedure, servicing. d) Alignment required in a monitor,	Front rear view block dia gram of monitor	Preparation of test reports, service reports.

				Block diagram of	Entrepreneurship and
		with PC's. Note: Experiment is to be repeated at different types, makes of monitors.	procedures. e) Circuit of vertical and horizontal section, power supply, EHT, and Video section. Possible defects, servicing procedure. f) Use of diagnostic tools for serving of monitor defects. g) LCD displays and Video/multimedia projectors.		
98-101	Installing, maintenance and Trouble shooting computer Printers.	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 cartridge of laser printers. l) Refilling toner cartridge of laser printers. m) Drum cleaning and replacement in	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. i) Carriage motor assembly, paper feed assembly, sensors . Procedure for dismantling and	Block diagram of printers. Showing various functional units	Entrepreneurship and financial assistance from financial institutions.

		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.	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,		

45

			replacement procedure. w) Control board(s) in inkjet printer, circuit diagram, defects and servicing procedure. x) Use of diagnostics software for identifying and servicing defective printers.		
102-103		REVISION			
104		FINAL EXAMINATION			

LIST OF TOOLS/EQUIPMENT FOR THE TRADE OF COMPUTER HARDWARE
(FOR A BATCH OF 20 TRAINEES)

SL.NO.	DESCRIPTION	For Instructors	For Trainees
TRAINEES TOOL KIT			
1.	Combination Pliers 15 Cm Insulated	1	20
2.	Diagonal Cutter 15 Cm Insulated	1	20
3.	Digital/analog hand held multi-meter	1	20
4.	End Cutting Nipper Insulated 15 Cm.	1	20
5.	Heat Sink Pliers	1	20
6.	I.C. Tweezers/Puller	1	20
7.	Knob Screw Driver Insulated 10 Cm.	1	20
8.	Long Nose Insulated Pliers 15 Cm.	1	20
9.	Multi-meters Analog or Digital hand-held/pocket type	1	20
10.	Neon Low Tester	1	20
11.	Screw Driver set Of 6.	1	20
12.	Soldering Iron (25 W)	1	20
13.	Tweezers 10 Cm Insulated	1	20
14.	Knife Electrician	1	20
SHOP OUT FIT			
1.	AC motor – 1 phase		1 No.
2.	AC motor – 3 phase – Instructional chart showing parts		1 No.
3.	Allen key sets		5
4.	AM/FM signal generator		2
5.	Anti static mat (as required around PC maintenance tables)		5
6.	Anti static wrist band kit	2	10
7.	Auto transformer		2
8.	Bar code reader		1
9.	Basic Electronic Trainer		5 Nos.
10.	Battery Charger suitable to charge secondary batteries		2
11.	Bench type Multi meter (for calibration)		2
12.	Cables of different types		As required.
13.	Calling bells of different types/makes		5

14.	Cat 5 UTP Cable		As Required
15.	CD ROM Drives (52X and above)		4 Nos.
16.	CD Writer.		2 Nos.
17.	Colour TV - 29"		1 No.
18.	Computer Microphone, Head set		4 each.
19.	Continuity tester for testing cables & connections	1	4
20.	Crimping tool for RJ 45 Connectors for use in networking	1	2
21.	Crimping tools to prepare different types of connectors (UTP cable and flat cable connectors)		5
22.	CRO (dual trace storage type 20 MHz or more)		5
23.	DAT with media (5 no.)		1 No.
24.	DC Ammeter (0 – 10 mA), (0 – 50 mA), (0 – 100 m A)		5 each
25.	DC Motor series & shunt		1 No. each
26.	DC Voltmeter (0 –1V), (0 – 10 V), (0 – 30V)		5 each
27.	De soldering pump (hand operated)	1	5
28.	Dentist mirrors		5
29.	De-soldering station of latest type with kit for IC extraction		4 Nos.
30.	Digital IC Tester		2 Nos.
31.	Digital IC trainer kit		5 Nos.
32.	DMM with Diode/transistor tester		5
33.	Drill bit set		5
34.	Drill machine pillar type – 1, High speed portable - 1		2
35.	DVD with media (5 Nos.)		2 Nos.
36.	Ethernet, SVGA cards.		
37.	FAX modem cards, Super IDE cards		5 Nos. each –separate modems.
38.	Fiber optic Networking trainer		1 No.
39.	Floppy disk (min. 3 box)		As required
40.	Floppy disk drive head cleaning kits		5
41.	Floppy Disk Drives 3 ½ and Hard Disk Drive.		5 Nos. each.
42.	Function generator		5 Nos.
43.	HUB 16 port / Layer 2 Switch		2
44.	IBM COMPATIBLE COMPUTER WITH LATEST PROCESSOR WITH MULTIMEDIA (ONE SERVER + TEN NODES WITH DISK + ONE COMPUTER FOR INSTRUCTORS PRACTICE/DATA/PRESENTATION/ STORAGE)	1	11

45.	Illuminated magnifying glass		5
46.	Interface cards for 8255, 8251, 8259, 8257, 8253, 8279 compatible to microprocessor training kit.		2 each.
47.	LAP TOP Computer with multimedia and modem.		1
48.	Light pen (with interface if required)		2 Nos.
49.	Linear IC trainers		5 Nos.
50.	Logic Probe		4 Nos.
51.	Logic Pulser		4 Nos.
52.	Micrometer (for measuring wire gauge)		5
53.	Microprocessor training kit (8085)		5 Nos.
54.	Mini transformer Winding machine		2
55.	MOD drive with media(2Nos.)		1 No.
56.	Modem (dial up)		4
57.	Monitors (VGA mono 2 Nos. SVGA colour 3 Nos.)		5 Nos.
58.	Multimedia Projector		1 No.
59.	Multimedia Speakers		4 Sets.
60.	Networking cards	1	11
61.	Over Head Projector		1
62.	PC internal cables for interconnecting drives and ports		10 sets.
63.	Permanent magnet of different shapes and magnetic compass		1 set.
64.	Philips alignment kit		5
65.	Printer DMP of Different types and sizes		4
66.	Printer Ink Jet		4
67.	Printer laser		2
68.	Refilling kit for inkjet printer		1
69.	Relays and solenoids of different types and makes		5 each.
70.	Rheostat – 100 Ohm, 1000 Ohm		5 each
71.	Routers		1
72.	Scanner (hand held 1 Nos. and Table top 1 Nos.)		2
73.	Screw driver star head		5
74.	Screw driver 3"		5
75.	Screw driver 6"		5
76.	Screw driver 8"		5
77.	Screw driver set with replicable bits		5
78.	Small adjustable spanners		5
79.	Small file set		5

80.	SMPS with ATX PC cabinets.		5 Nos.
81.	Soldering Station		5 No.
82.	Spare Mother boards, DIMS 128 Mb, 256 Mb and latest capacity of latest ROM type.		5 Nos. each.
83.	Standard Wire Gauge		5
84.	Stepper motor		2 Nos.
85.	Table lamps		5
86.	Telephone facility for using internet		1
87.	Tool for making inter connecting cables		2
88.	Touch screen monitors		2 Nos.
89.	TTL CMOS IC		As required
90.	Types Keyboards, Types of Mouse (including one optical mouse, cordless mouse)		5 Nos. each.
91.	Universal counter		4
92.	UPS (off line 1 KVA 2 Nos., 2KVA- 2 Nos.)		4
93.	UPS on line 3 KVA.		2
94.	Vacuum cleaner		1 Nos.
95.	VCR		1 No.
96.	VDC player		1 No.
97.	Voltage stabilizer/CVT(1 KVA – 2 No, 5KVA – 1 No.)		3
98.	Watch maker screw driver set		5
99.	Web Camera		2 Nos.
100.	Wire stripper	1	5
101.	ZIP drives (100Mb/250 Mb) Internal – 2 Nos. External – 2 Nos. with media (5 Nos.)		4 Nos.
SOFTWARE			
102.	Anti virus for stand alone and network		1
103.	Bench marking software's (Preferably free down load)		
104.	Diagnostic software's.		As required
105.	Internet account (calculated based on maximum of 50 hrs per month)		1
106.	Latest Microsoft office suit (Omit this if COPA trade is conducted in the institute)		1
107.	Self learning packages		As required
108.	Windows 98.		1 No.
109.	Windows NT latest version/WINDOWS XP (10 USER)		1 No.

	COMPUTER CONSUMABLES (per year)		
1	Floppy diskettes		As Required
4	Printer Ribbon, refill cartridges, toner cartridges.		As required.
5	Printer stationary		As required.
3	Re writeable CD's .		10 Nos.
2	Writable CD's		As Required
	CLASS ROOM FURNITURE		
110.	Chalk board		1
111.	Computer maintenance table, round of 3-4feet Diameter.	1	5
112.	Cup board for library		5
113.	Cup board for storing computer spares	3	5
114.	OHP Trolley		1
115.	Pigeon hole lockers for trainees		As required
116.	Student chair swivel type		20
117.	Student table		20
118.	Teacher chair swivel type		2
119.	Teacher table		2
120.	White board		1
121.	Wood stools for maintenance tables (@ 4 per table)		20
	GENERAL CONSUMABLES		
122.	Analog ICs		As Required.
123.	Bread board for wiring practice	2	20.
124.	De-soldering Wick		As required.
125.	Different types and ratings of Fuses		As required
126.	Different types of connectors		As required.
127.	Different types of Switches		As required.
128.	Different types of wires, cables		As required
129.	Digital (gates, adders, FFs, Counters, mux/demux, etc., as required for exercises)		As required.
130.	Diodes, Zeners, Transistors, UJT, FET, SCR, TRIAC, DIAC, of different types, ratings.		As required.
131.	High frequency transformers		As required.
132.	Memory modules of PCs, 128, 256, 512 etc., DIMM or latest		5 each
133.	Metal sheets for bending, drilling, riveting and tapping practice		As required.
134.	Miniature lamps (3/6/12Volts)		20

135.	Nuts, bolts, Rivets, screws		As required.
136.	Primary cell of different sizes and types		1 set.
137.	PTC, NTC, LDR,VDR, Pots, Presets		As required.
138.	Re-chargeable secondary batteries		5
139.	Resistors, Capacitors, Inductors of different types, ratings		As required.
140.	Solder and Flux		As required.
141.	Spare Lithium battery for mother board		As required.
142.	Speakers of different ohms and wattage ratings		5
143.	Specific connectors and cables required for internal PC wiring and for external ports (serial and parallel).		5 sets.
144.	Step-down transformers		20
145.	Tag board of suitable size for circuit wiring practice	2	20
VIDEO and other Teaching Aids			
146.	Video on Artificial respiration		1
147.	Video on DGE&T		1
148.	Video on Electrical safety		1
149.	Video on First aid		1
150.	Video on Satellite communication		1

NOTE:

1. Specification of Computers and Peripherals may be updated by the competent authority from time to time, at the time of purchase in view of the fast changes in technology and market trends.

2. Any raw material required to conduct the listed practical exercises but not found in the list may be added.

3. Training Video CD on different areas relevant to the Practical and theoretical contents, not listed may be added.