SYLLABUS ON

MECHANIC CONSUMER ELECTRONICS

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 CONSUMER ELECTRONICS
2.	N.C.O. CODE NO.	:	
3.	Duration of Craftsmen Training Scheme	:	2 YEARS
4.	Entry Qualification	:	Passed in Matriculation examination under 10 + 2 system of education with Mathematics and Science or its equivalent.
5.	Rebate for Ex-Craftsmen Trainees	:	
6.	SPACE NORMS	:	5 SQ. MTS PER TRAINEE

LIST OF MEMBERS

S.No.	Name & Designation	Organization	Committee
1.	Sri M.Singa Raju, Director	ATI-EPI, Ramanthapur, Hyderabad	Chairman
2.	Sri V.M.Rao, Jt. Director	ATI-EPI, Ramanthapur, Hyderabad	Member Secretary
3.	Sri B.Satya Kumar, Dy.EE/TV	I & P.R. Department, 102-1, Samachar Bhavan, A.C.Guards, L.B.Nagdar, Hyderabad-500 004	Member
4.	Sri K.D.Ambi, Jt. Director	Electronics Test & Development Centre, Kamala Nagar, Kushaiguda, Hyderabad-500 762	Member
5.	Sri Khamaruddin, Station Engineer	All India Radio, Rock Fields, New Public Gardens, Hyderabad-500 004.	Member
6.	Sri P.Ranga Swamy, Asst. Station Engineer	Doordarshan Kendra, Ramanthapur, Hyderabad-500 013	Member
7.	Dr.C.Ramachary, Associate Professor	University College for Women, Kothi, Hyderabad-500 001	Member
8.	Sri K.T.Chary, In-charge, ICG	E.C.I.L., Cherlapally, Hyderabad-500 762.	Member
9.	Sri M.Karthava Chary, CIU-CC-Head-EEBG	M/s BPL Limited, B-3, IDA, Uppal, Hyderabad-500 039.	Member
10.	Sri M.N.V.R.Subba Raju, Retd. Station Engineer (AIR)	Kranthi Colony, Uppal, Hyderabad.	Member
11.	Sri Vitta Rao, Retd. Station Engineer (AIR)	23, Radio Colony, Chintalkunta, L.B.Nagar, Hyderabad-500 074.	Member
12.	Sri Venkateswara Rao, Retd. Asst. Engineer (AIR)	C/o KVR Institute, Ramanthapur, Hyderabad-500 013	Member

PERIOD OF TRAINING: 02 YEARS

Note: 1. The syllabus given below is a guide for the Instructors to prepare their own schedule of training. The portion in respect of different subjects, which has been indicated against different weeks, may be adjusted according to the training schedule prepared by the Instructors concerned. While teaching Engineering Drawing, emphasis should be laid on free hand sketching, blue print reading, drawing of circuits and parts related to the trade. Similarly emphasis should be given on problems related to the trade according to the syllabus given for workshop calculation and science.

No. of weeks	Syllabus list	Theory	Practical	Equipment required	Engineering drawing	Workshop calculation and science.
1.	2.	3.	4.	5.	6.	7.
1.	Know your institute	a) Organization of the institute, departments, various trades and functions. b) Types of work, responsibility to be under-taken, incentives and future Planning of profession. c) Safety precautions to be observed in the trade oath during "theoretical periods" and "practical	a) Visit to the institute. b) Introduction with the Principal and other teaching staff. c) Demonstration of various systems of the trade like Radio/ Tape recorder /TV controls. d)Care & Safe working habits, Safety Precautions to be demonstrated to the trainees.	Power supply switchgears. Fire extinguishers. First aid kit. First aid chart. Instrument boxes and Drawing materials. Student's tool kits and workshop tools.	What is Engineering Drawing? Importance, Free hand sketching of St.lines, rectangles square, circles, polygons etc. Free hand sketching of tools. Reading of simple drawings and concept of dimensions and dotted lines, chain line etc. magnifying glass.	Introduction to electric supply systems. Properties and uses metals and non-metals related to trade. Copper, Zinc. Tin, Aluminum, Brass, Bronze.

		hours/workshop hours" d) Elementary first Aid. e) Earthing types and importance.	e) "Elementary First Aid" practice, Artificial respiration practice.			
2 & 3	Basic work-shop	Identification, specifications, uses and maintenance of hand tools.	Demonstration and uses of trade hand tools-screw driver, pliers etc. simple mechanical fixtures, types of screws, bolts, washers, clamps, rivets, taps, connectors. Simple fitting practice, fitting and drilling practice. Simple threading practice. Simple sheet metal works. Demonstration on Pneumatic screwdriver.			
4 & 5	Basic Electri-city	Matter, molecule atom, conductor, insulator, semiconductor, classification.	Identification of conductors, insulators with specifications. Use S.W.G.	S.W.G. multimeter soldering iron. Temp. Controlled soldering station.	Reading of simple drawing. Free hand sketching of simple solids with dimension.	Solder timber, rubber diff. Types of P.V.C. materials used in Electronic

		Voltage current, resistance, Ohm's Law, specific resistance, Skin effect, S.W.G. Kirchoff's Law, voltage source/constant voltage source, current source/const. Current source.	demonstration of different soldering iron. Practice of soldering & desoldering. Practice of simple series and parallel ckts. And mixed. Verification of OHM's law.			Industry.
6.	Resis-tors	Classification of resistors with specifications and use. Construction of resistors. Colour code. Explanation and only use of analog and digital multimeter. Testing different types of heaters and electric irons.	Identification of resistors. Colour code practice. Use of multimeter measurement of voltage, current and resistance. Tests on and use of classified resistors Carbon (various W), W/W, PCT (Log & Linear) Pre-set etc.	S.W.G. multimeter soldering iron. Lead acid battery, cells, Multimeter. Different types of heaters, electric irons	Free hand sketch of solids viewed perpendicularly to their surface and axes.	Use of diff.sheets, ferrous and non-ferrous. Decimals addition, subtraction, multiplication, division, conversion of decimals to common fractions and vice versa.
7.	Battery	Explanation of cells. Leclanches cell. Primary cells, secondary cells, battery construction – charging rate. Efficiency Amp.	Testing of primary and secondary cells. Use of cells and battery in ckts. Preparation of Electrolyte.	Assorted cells and batteries Assorted rheostat, hydrometer, Battery charger, Battery tester, Cells Tester.	Free hand sketches of nuts & bolts with dimensions from samples. Ckts. And wiring diagram.	Reduction of common fraction to decimals fractions. Brief description of manufacturing process of steel,

		Hr. capacity. Types of charging – Silver oxide L.C.R. bottom cells. Alkali cells- construction – charging efficiency – use, advantages. Familiarization Tubular batteries. Nickel CAD batteries, Lithium-ion batteries. Different types of Maintenance of lead Batteries.	Preparation of charging by a charger. Use of Sp.gr. tube / hydrometer.	Tubler batteries Nickel type. Maintenance Free Batteries.		copper aluminum.
8 & 9	Electro-Magne-tism	Explanation of magnetism. Classification of magnets and their materials. Properties of magnets. Uses and preparation of artificial magnets. Magnetic needle. Magnetic keepers. Explanation of Electromagnetism. Properties advantages, disadvantages - application types of	Demonstration of the properties of P.M. Use of magnetic needle. Simple practice of converting a magnetic material into a magnet by a bar magnet. Preparation of a solenoid. Use of magnetic needle. Preparation of electro magnets for a calling bell /buzzer. Preparation of	Assorted per magnets. Magnetic needles. Assorted Bells & Buzzers. Assorted relays. D.C. shunt generators / motor.	Expl. Of simple orthographic projection 1st angle.	Metric system metric weights and metric measurements, units conversion factors. Manufacture of plastic and resins.

		cores. E.M. relays – types – uses. EM & ES Radiation protection for sensitive devices. Concept of generators & motors only. Principle classification. To build up E.M.F. in a generator only starting of a D.C. Motor only miniature motors.	E.M. Relay. Testing of types of relays. Rewinding of E.M. Re-lays & small re-pairs. Building of EMF in a Generator starting of a DC shunt motor.			
10 & 11	Alterna-ting Current.	Explanation of A.C. comparison with D.C. expl. Of induction and induced E.M.F. Faraday's Law, Lenz's Law A.C. Generator – Left hand and right hand rules. Instantaneous values R.M.S. Values – phase – cycle – Time period – frequency.	Demonstration of A.C. & D.C. Demonstration on Induced E.M.F. Demonstration L.H. & R.H. Rules. Demonstration on instantaneous values and R.M.S. values. Demonstration on phase, cycle, 'f' measurement A.C. voltages and current.	Oscilloscope A.C. Auto Var. Models on L.H. & R.M. rules. Low frequency oscillator multimeter 'f' counter.	Expl. Of simple orthographic projection 3rd angle.	Meaning of tenacity elasticity malleability brittleness hardness compressibility and ductility with examples.
12	Induc-tance	Define-Inductance. Explanation of	Identification of assorted inductive	Oscilloscope A.C. auto var.models	Expl. Of simple orthographic	The weight of a body. Units of

		Inductive reactance, - types specification. Behaviour with A.C. – impedance. Coil concept – power factor. Self & mutual induction co-efficient of coupling. Expl. Of transformer – types – turns ratio – uses – losses – efficiency. Hysterisis & eddy current – types of cores to be used for L.F. H.F. & V.H.F. transformer.	reactances – checking, testing & rewinding upto a specification. Induction – impedance & P.F. Measurements. Demonstration on self and mutual induction. Identification of assorted transformers – testing and rewinding upto a specification.	on L.H. & R.H. rules. Low frequency oscillator. Multimeter'f' counter. Assorted inductive reactances. Assorted transformers.	projection 3rd angle.	weights & shop problem percentage and its application. Shop problems.
13.	Capaci-tance.	Expl. Of capacitance & capacitive reactance. Classification of capacitors with specification. Electrostatic action dielectric constants, material used. Series and parallel connection. Colour codes uses.	Identification and testing of different types capacitors. Colour code practice. Behaviour of capacitor at different frequencies. Measurement of capacitance and PF	LCR Bridges – Digital and Analog multimeters, power supply, oscillator.	Expl. Of simple orthographic projection 3rd angle.	C.G.S.M.K.S. and their conversion problem.

14.	AC Motors	Principle classification on uses: Single-phase motor. Fractional H.P. motors… Capacitor motor. Expl. Of principle A.C. 1 phase. Motors, types, construction.	Identification, testing & running of 1 Ph. Motors.	Capacitor motor. Electric fan grinder washing machine.		
15.	LCR Circuits and Reso-nance	Expl. Of resonance. Importance – equations series and parallel resonance. Impedence, Admittance, Circuit Q. Ckt. Elements – natural resonance, tuning, and voltage gain Anti – resonance ckt. uses in electronic ckts.	Determination of resonance. Characters for series and parallel. Tuning to a given frequency.	Oscilloscope, signal generator DMM	SIMPLE iso-metric drawings, isometric views of simple objects such as square, cube rect6angular blocks. Detailed diagram of electro-magnets.	Ratio and proportion shop problems, plotting and reading of simple graphs. Works unit of work, energy power.
16 to 17.	Measu-ring Instru-ment (applica-tion)	What is meter? Importance of meter. Classifica-tion of meter. Forces necessary to work a meter. M.C. Instruments. M.I. Instruments. Universal	Demonstration on the function of M.C. and M.I. meters. Measurement of resistance, voltage, current frequency, etc. by Ammeter,	Assorted analogue meters. Multimeters models/kits for assorted ckts. Shunt and series resistors. Standard meters. Meggars, CRO,	Familiarizing and sketching and details of components.	Applied problems. Algebraic symbols addition, subtraction, multiplication division, standard algebric formula (a+b) 2, (a-b)2.

		Instruments, range extension of meters. Need of calibration. Multimeter. Characteristics of meters. Resolution, Accuracy, Primary & Secondary Standards. Errors in meter use of meters in different ckts. Use of CRO etc. care and maintenance. Use of insulation tester. Types of Bridge circuits and their uses in measurements.	voltmeter, ohmmeter, frequency meter. Expts. On 'range extension' of meters. Use of multimeters. Servicing of multimeters. Demonstration on calibration of meters. Demonstration on insulation tester.	function generators.		Simple simultaneous equations with two unknown measuring of friction examples, meaning of C.G.
18.	Introduc-tion to Vacuum Tubes & Semi Conduc-tors	Types of emission vacuum tubes and types of 'semi-conductor' intrinsic and extrinsic semi-conductors. Temperature coefficients. Definition of 'P' and 'N' types of semiconductor. . How to make N type & P type Silicon &	Film on semi conductor. Film on P.N. junction. Demonstration on Barrier –potential for Ge & Si	Video films on Semi conductor video films on P.N. Junction diode Digital multimeter.	Use of drawing instruments. 'T' square, drawing board construction of simple figures and dimensions.	Specification gravity balancing examples.

		Germanium material. Biasing of P type & N type Semiconductors, Majority carriers & Minority carriers				
19 to 20	Semi Conduc-tor Diode	Expl. Of Diode classifications of Diodes characteristics of diode. Varactor diode. Zener diode, Tunnel diode, Temperature effect. Diode as rectifier – half wave – full wave bridge rectifiers, Peak inverse voltage in different rectifier circuits. Coding of diodes. Testing of diodes, Study of the diode junction parameter.	Testing of diode. Characteristics of diode. Characteristics of Zener diode. Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt.	DMM oscilloscope. Basic electronic trainer kit	Use of different types of scales in inch & millimeters. Lettering numbers and alphabets.	Areas of rectangles, circles, regular, polygons. Calculation of areas, volume, weight of simple solids – cubes squares, hexagonal prisms shop problems.
21	Filter Circuits.	What is a filter circuit? Types of filter circuits. Expl. Of Xc, XL, High pass, low pass, Band pass filters. Band stop & Notch filter. CR	Demonstration on various filters ckts. Assembly, testing and 'L' 'T' & PAI filters. Demonstration on H.P. L.P. & B.P. filters circuits.	Digital multimeter oscilloscope. Basic electronics trainer. 3MHz function generator.	--	Heat and temperature thermometric scales- Fahrenheit, centigrade and their conversion Kelvin Rea-mer

		and L/R time constant.				Celsius.
22 to 24	Bipolar Junction Transis-tors	Bi-polar junction transistor principle of operation, types of transistor. Tests of transistor. Symbol characteristics. Biasing of transistor & Mode of application. Arrangements of a transistor in a cut. Conditions for the use of a transistor. Current flow in a transistor. ALPHA and BETA of a transistor. Thermal run away. CB, CC, CE, Configuration.	Identification and testing of a transistor. To study alpha & beta of a transistor/characte ristics of a transistor (static and dynamic). To study the function of a transistor as an amplifier.	Digital Multimeter milli-ammeter, micro ammeter, milli voltmeter. Signal Generator oscilloscope. Bipolar transistor various types. Power supply basic electronics transistor.	Drawing of various electrical ckts. With B.I.S. symbols of ckt. Series and parallel ckt. Power transformer instrument transformer etc.	Meaning of stress, strain modules of elasticity, ultimate strength B-11 curves.
25 to 27	Ampli-fier	Explanation of amplifier frequency spectrum. Classification of amplifiers. Coupling Methods. RC, Transformer and DC Amplifiers. Class A.B. A-B, 'C' Amplifiers. R.F. amplifier,	Demonstration, assembly and testing of transistor amplifier in Class A, B, AB, C complementary symmetry – modes. Assembly, testing and frequency	Multimeter, D.C. Low voltage power supply. Signal generator. A.F. -Do- R.F. HF oscilloscope output meter.	Free hand sketching of plan & elevation of simple objects – hexagonal bar, sq. bar, circular bar, tabard bar, hollow bar etc.	Simple problems on Lines, angles, triangles and circles.

		Voltage amplifier, small signal, large signal, signal to noise ratio. Definition of BEL & expressing voltage & power gains in of an amplifier in decibels. Power amplifier-types Push-Pull, complementary symmetry) (transformers out put). Thermal stability and heat dissipation. Biasing and couplings. Frequency compensation, preamplifier. Cascading of amplifiers. Feedback amplifier.	response of a give stage amplifier with voltage amplifier and power amplifier. Study of P.C.B. of an amplifier. Fault location and servicing of an amplifier. Fault location and servicing of an amplifier.			
28 to 30	Oscilla-tor	Define oscillator, importance, and applications to electronic ckts. Explanation of vibration and oscillation. Factors controlling	Demonstration on various oscillators. Study of Feed back in an oscillator ckt. Assembly of an AF oscillator testing and	Various AF & RF oscillators. Multimeter oscilloscope. Frequency counter. Remote control devices – toys etc.	Block diagram of an oscillator. Symbols for different wave shapes square, saw tooth sin. Triangular etc.	Calculated of ‘f V from=V time period Giga heat Z mega heat Z micro etc.

		oscillations types – AF-RF feed back, Tank ckts. Wein Bridge Oscillator, RC Phase Shift Oscillator, Hartley Oscillator, Collepit Oscillator, Crystal oscillator, oscillators – used in Radio ckts. TV ckts. Tape recorder etc. function generator other applications of oscillators. Tone generation. Remote etc.	measuring the 'f' of generated oscillations. Study of an RF oscillator. Fault finding and servicing station oscillator.			
31	Modula-tion	Wavelength, Propogation, Velocity of sound, Define modulation , Need for Modulation types of mode – AM FM PM – application Broadcasting. Bandwidth mode index. Definition and importance of demodulation.	Measurement AM & FM modulation.	Function generator, Signal generator and CRO	Drawing of AM & FM modulated wave at various modulation 100 pc. 50 pc. Etc.	Determination of velocity ratio, mechanical advantage and efficiency.
32 to	Sensors and	LEDs, Photo diodes, Lazer	Demonstrations and testing of	Assorted microphones.	Symbols as per different semi-	Calculation of current voltage, in

34	Trans-ducers.	Diodes Photo-transistors, thermistors, LDR. VDR, etc. I RED, Photo multiplexer. Explanation of microphones – types, Cordless microphones, uses specifications etc. Explanation of loud speakers – types, Maximum power theorem, matching of speakers/horns /baffles / enclosures. Line transformers.	various microphones. Identification, testing and servicing of microphone spares. Identification testing and servicing of lour speakers. Arrangement of speaker/horns in a room / auditorium and for an open gathering. Impedance matching. Demonstration on 2/4/6 channel stereo system.	Assorted loudspeakers. Assorted horns A.F. amplifier Line transformer. Multichannel stereo system. Multimeter , DMM oscilloscope.	conductor devices – VDR, LED thermister and their use in ckts.	voltage dividing network using thermister, VDR, LDR, and different temp. voltage, light intensity etc.
35 to 37	Radio Recei-vers	Full explanation of Radio receiver super heterodyne principle of 'frequency changing' Radio chain, terms used in radio transmission – Ionosphere, ground wave propagations. Electro magnetic	Demonstration on a multilane Radio Receiver. Study of radio cut. M.W. -Do- multilane. Identification of R.F. stage. Identification of I.F. stage. Identification of A.F. stage.	Assorted Radio Receiver (multiband)multi meter DMM Oscilloscope.	Exercise on Blue print reading/ckt. Reading of house service connections and small power ckts. Connection of ammeter volt meter, Watt-meter Kwh meter with I.S.I. symbol ckt. Reading and	Logarithm. Use of log-tables for multiplication and division. Determination of efficiency of simple machines – Wrench, pulley blocks, wheels and compound axis.

		waves, reflection, transmission, wave length. Space wave & Sky wave. Explanation of 'frequency' ranges resonance. Image frequency, acceptor ckt. and rejecter ckt. Fading of radio signals, Diversity reception. Disadvantages of R.F. amplification. Sensitivity and selectivity. Fidelity. Signal to noise ratio. Block diagram of a radio receiver.	Study of assorted 'Band switches' practice on 'Dial threading'. Study of the PCB of the R/R ckt.		drawing of different stages of R/R. Free hand sketching of trade objectives.	
38 to 41	Tuning Section (R.F.) section)	Explanation of tuning section/R.F. section. Block diagram. Antenna ckt. Oscillator ckt. Mixer stage. I.F. generation. R.F. amplifier A.G.C., types of transistors used. Specifications of ant. & Oscillator coils with types of Gang condensers'.	Study of R.F. section of R/Rs for both P.N.P./N.P.N.Ant. and oscillator alignments. Study of different band switches. Ault finding and servicing of R.F. stage. Checking of sel4ectivity. Checking of	R/R both P.N.P. and N.P.N. millimeter signal generator. Oscilloscope D.C. power supply.	Ckts.of magnetic controller with dynamic breaking, drawing. Convertion. Stage of R.R. both PNP/NPN. Layout of battery charging ck. From D.C. shunt generator.	Problems of mensuration, sq. hexagon, prism atmospheric pressure, pressure gauges, absolute pressure properties of matter.

		Types of 'band' switches. Used connections conditions for better selectivity and sensitivity.	sensitivity.			
42 to 43	I.F. Stage and Detec-tion.	Explanation of I.F. the importance of I. F.range for M.W. and S.W. ckt. Analysis of I.F. stage. Transistors/I.C. Used their characters. Alignment of I.F.stage. explanation of detection/ demodulation. R.F. by pass. Tuning indicators with their ckt. Arrangement types. A.F.C./A.G.C. line, importance.	Study of I.F. Stage of R.R for both PNP / NPN. Study of detector stage of R/R for both PNP/NP. Study of AVC/ AGC ckt. Alignment of IFT for desired I.F. testing of IFTs replacement of IFTs and realignment. Fault fin-ding by meter/by signal traces/by scope.	R/R – both PNP and NPN multimeter signal generator. Signal tester 20 MHz CRO.	Drawing of IF stage of both PNP and NPN ckts.	Different force on material in such application as extending, bending, twisting and shearing. Trigonometric tables, applied problems.
44	Audio Stage	Explanation of audio stage, types of amplification, driver stage output stage. Transistors used. Tone control. vol. Control.	Study of audio stage, driver stage, output stage, tone and vol. Control stage. Ault finding and	-Do-	Details of electrical control panel.	Calculation of bias. Determination of gain of air at different load.

			servicing.			
45	Fault Finding.	Preparation of servicing charts for fault finding in audio amplifiers and in R/receivers. Data sheet and history sheet. Replacement charts/equivalent. Charts.	Servicing practices.	Signal tester 20 MHz CRO.	Drawings of CB. CE and DC amplifier ckt. Drawing of class & B amplifier ckt. Different power output stages PP complemen-tary symmetry etc.	Simple calculation of power output and liaising.
46	FM Radio Receiver	Basic wave forms, Modulators and demodulator and their working principles. Advantages of Frequency Modulator. Block diagram and working principle of FM Radio Receiver (Mono/Stereo). Trouble shooting FM Radio Receiver.	Study of FM Radio Receiver, Service Practice	FM Radio Receiver, Signal Generator		
47 to 50	Tape Recor-der	Expl. Of magnetic recording principle with block diagram types. Function and	Demonstration of magnetic recording plays back. Fast-	Tape recorder: i.Cassette. ii.Spool multimeter.	Block diagram of a tape recorder. Circuit diagram of C/L relay.	Problems of menstruation. General condition of equilibrium for

		use of magnetic tapes, recording heads, erasing heads, bias oscillator. Dolby system motors used and speed control speeds of tapes. Care and maintenance idea of stereophonic recording and reproduction system. Servicing charts. Specification of tapes and cassettes. Idea of standard recorder. Idea of equalizers. Introduction to Car Stereo System. Block diagram and working principle of Car Stereo System. Various circuit diagram of Car Stereo Systems and familiarization of the mechanisms of Car Stereo Systems. Trouble shooting Car Stereo	forward and rewind study of recording and easing circuit, study of mechanical assemble with motor, cleaning of Heads, fault finding and servicing study of 'Auto stop'. Study of two-in-one circuit. Study of a car stereo circuit. Azimuth correction.	Car Stereo System	Drawing of a limit switch.	series of forces on a body. Plotting of grapher. Simple problems of grasper. Brief description and properties of silicon hicrome silver etc.

		Systems.				
51		Revision+	Need of standards – Types of standards – Diff. Standard Bodies – implementation.			
52	TEST					
Achievement: At the end of first year, trainees will be in a position to assemble/test and repair different power electronic ckts. , Audio amplifier and A.M./F.M. radio receivers.						
53 to 54	Thyris-tors UJT, FET	Explanation of characteristics, uses of UJT, FET, SCR, SUS, SBS, TRAIC, DIAC Expl. D.C. motors, speed control by SCR/TRIAC and DIAC.	STUDY and assembly of a UJT triggered ckt. Study and assembly of FET amplifier ckt. Study of a ckt. Using MOSFET study of a ckt. SBS & SCS Study of SCR In AC study of voltage control by SCR. Study of TRIAC and DIAC. Study of IC ckts. Amplifier, switching ckt. Demonstration in different types of motors Study of	Models of UJT triggered ckt. FET as power amplifier. Models as SBS SCS electronic power regulator. Analogue IC tester. Microproces sor kit. Oscilloscop e multimeter. EVM function generator. DC motors,	Drawing of UJT triggered ckt. With ISI symbol. Power amplifier ckt. With FET ISI symbols of SBS, SCS voltage regulator ckt. Motor control ckts. AF amplifier ckt. Free hand sketch, Digital ICs , Seven Segment	Problems on menus ration problems. Atmospheric pressure. Pressure gauges. Absolute pressure. Properties of matter. The module and atoms. Different between mass and 2weigh.

			speed control by SCR.	series, shunt, micrometer. Electronic starters.		
55 to 57	Wave Shaping Circuit (linear and non linear)	Pulse / wave shaping ckts. -Do- differentiation and integration ckt. Clipping /clamping.	Study of different pulse shaping ckts. Assembly and testing of a differentiation and an integration ckt.	Function generator oscilloscope TV set.		Calculation of RC constant in AGC ckt. Frequency calculation of R-C and L-C oscillator.
58 to 62	Digital Electro-nics.	Explan. Of Digital system, compa-rison with ana-logue, advantages – application, Number Systems – Binary, Hex. Conversion. Octal BCD, basic logic gates, Enco-der, Decoder, Multi-plexer, Demulti-plexer. FLIP – FLOPs, Counters, Shift Registors, ALU Adder sub-tractor classifica-tion of Digital ICs and precaution to be taken while handling CMOS	Study of Digital ICs. Verification of logic gates Encoder, Decoder, Multiplexer, Demultiplexer Flip-Flop, Counters, Registers, Adder Subtractors	Digital IC Trainer kit various Digital ICs, Logic Probe.	Free hand sketch, Digital ICs , Seven Segment display	

		ICs. Introduction to DAC/ADC				
63 to 65	LINEAR ICs.	Explanation of 741, 555, 723 and 7805. Operational amplifier IC 741 applications as INV / NON INV/ Summing amplifiers, integrator & differentiators. Precision rectifier comparators. IC 555 as Astable, Monostable, Bistable MV. IC 723 as 7V –35V regulator. 3 pin IC Regulators.	Practicals on 741 for applications, as inverting/non-inverting, summing amplifier integrator, differentiator, comparator and FG. Practicals on 555 as monostable and Bistable Multivirbrator IC 723 and 7805 PS circuits.	Linear IC trainer, ICs 741, 555, 723 and 7805.		
66 to 68	Micro-process-sor	Introduction to microprocessor/micro computers, Memories Intel 8085. Architecture Instruction set of 8085, Microprocessor. 1. Data transfer group. 2. Arithmetic group.	To familiarize with 8085 Microprocessor kit. Data transfer group. Arithmetic group. Logic group. Branch group. Intel 8155/8156 stack. I/o. and machine control group. Instruction of 8085	Preparation of layout PCB track layout repairing rough layout on graph paper to the scale. Points to be considered in preparing PCB layout,	Microprocessor trainer kit. Logic probes. Oscilloscope. Frequency counter DMM.	

		3. Logic group. 4. Branch group 5. Stack, I/o. and machine control group. Basic Programming of 8085 such as adding, subtraction of two 8 bit numbers. Finding the largest number, etc. Block diagram and pin diagram of 8255 PPI and its operation. Microprocessor applications such as Switching LEDs, Stepper Motor Controller	Programming examples. Study of 8255. Study and Demonstration of Microprocessor Applications.	track width used power lines and for signal lines. The placement or location of compo-nents on the PCB prepa-ring fair dra-wings of he PCB track-side. Draw-ing of com-ponent lay-out for legend printing. Preparation of drawing for solder marking.		
69	Com-puter	Introduction to Computer, Block diagram of PC, DOS, WINDOWS. Familiarization of Multi Media Sys-tem consisting of CD ROMS, DVD ROMS, Sound Cards, 3D Video	Identification of PC components and Devices. DOS/Windows. Familiarization with operation of PC	PC with Multi Media System, Video Projector	Preparation of Art works in double scale. Stepper Motor Interface Weighing Machine PC with Multi Media System	

		Cards, Video Projector				
70 to 72	Power Supply	Expln. Of power supply, importance, types- un regulated, regulated-types of regulation. Stabilizers – types of SMPS blocks. Invertors' ckts. and converter ckts. Blocks diagram diagram of UPS. Surge protection, Emergency lights.	Demonstration of various power supply. Assembly & testing of an unregulated power supply. Assembly & testing of a voltage stabilizer as per specifications to be used for a TV refrigerator. Demonstration of UPS system. Assembly & testing of a SMPS for a CTV, Emergency lights, Microwave oven.	Reading of simple ckts. Emergency light		Calculation Of Areas Of Triangles, Polygons With The Aid Of Trigono-metry
73	Oscillo-scope	Expl. Of oscilloscope, importance, applications, diagrams. Introduction to construction and function of CRT – CRO use of CRO care and maintenance.	Demonstration a CRO example of 'X' & 'Y' axes controls. Mea-surements of DC voltages, AC vol-tages frequency etc. comparison of waver. Use of 'scope' in testing and fault location.	CRO. LP and HF signal generation 'Video film' oscilloscope .	Drawing of block diagram of oscilloscope. CRT circuit's diagram of oscilloscope.	General condition of equilibrium for series of forces on a body. Plotting of graph. Simple equation of graphs.

			Practice on scope for measurements.			
74 to 77	Trans-mitter	Example of transmission systems. Block diagram. Frequency multiplier. Feeders and types of antennas frequency and phase modulation. High voltage power unit's Police wireless, microwave link and satellite communication (example and block dia. Only)	Demonstration on various transmitting systems. Study in blocks the ckts. Of transmitters.	Transmitter if available)	Drawing of ckt. Of signal generator. Function generator. DC speed control ckts. With ISI symbols.	Representation of forces by vectors, simple problems on lifting tackles – Jig. Wall cranes solution by vectors.
78 to 81	Commu-nication System.	Function block diagram and example of telegraph system. -Do- telephone -Do- radio photo -Do- trans. Receivers. -Do- UHF, VGH, Microwave and radar system -Do- satellite system.	Study/demonstrati on on telegraph system. -Do- telephone -Do- digital phone. -Do- Trans receiver VISIT to different transmitting stn. (If possible) video film shown on satellite	Model of telegraph and telephone system. Trans receiver. 12 line intercom system with 'exchange' multimeter Mobile Push	Drawing of separated sync. Pulses, AGC and sync. Separator ckt. Drawing of AF amplifier ckt. With six stage and with types of out-out PP	Simple calculation of compensating components values for frequency ranges. Calculation of voltage dividing network-using resistance. To calculate current in different resistive network using Diode Zener in FB & RB

		-Do- navigation ILS. Definition and explanation of 'intercom' system. Explanation of cordless/receiver & types, function and testing. Explanation of 'exchanges', used, explanation of power supply. Functional Block Diagram of various Telephone instruments such as Push Button type and CLT types. Working principle of telephone instruments. Trouble shooting of telephone instruments. Introduction to Mobile Cellular phone. Introduction to FAX Machines and Photo Copier, Micro Oven &	communication. Demonstration of 'intercom' system. Study of cradles/receiver Study of Telephones & Cordless telephones, Cell phones, Study of power supply of 'intercom' system. Fault finding and servicing of 'intercom' system, Micro Oven and Photo Copier	button type telephones, Cordless Telephones, Cellular Phone Fax Machine, Photo Copier		

		Photo Copier				
82 to 88	Televi- sion Systems	Expl. Of TV systems B&W block diagrams for both. Transmitter and receiver. Idea about video camera. Scanning system. Frame, field, raster, picture elements. Compositive video signal. Aspect ratio, resolution, flickering, contrast, brightness video signal, sound signal channels, bands, expl. Data preparation for tuners. i.Mechanical ii.Electronic -Do- Fitter ckt. SAW Filter -Do- video IF with staggered tunned -Do- Video amplifier and picture tube -Do- Sweep	Demonstration on a B&W TV identification of diff. Controls. -Do- Controls. -Do- Tuner, testing and replacement. -Do- wave trap ckt. And testing. -Do- Video IF -Do- staggered tuning of video IF -Do- Video amplifier -Do- Picture tube -Do- sweep ckt. -Do- Horizontal -EHT FM sound -Do- section. -Do- power supply -Do- SMPS -Do- STR -Do- Preparation.	'Video film' How TV works'. TV sets B&W make diff. Company with servicing manual. Pattern generator multimeter DATA book TV demonstrati on kit. Sweep generator with 'X-Y' display. Video TV Camera	Drawing of the block diagram of a TV set. Drawing of picture tube. -Do- electronic gum. -Do- defection Yoke. -Do- speaker. -Do- video Amplifier ckt. -Do- SWAF -Do-EHT ckt. -Do-EHT ckt. -Do- compositive video signal. -Do- 'YAGI' antenna. -Do- the circuit of wabbulator. -Do- Vidicon camera – tube.	Trigonometric function – use of trigonometric tables. Applied problems. Calculation of areas of triangles, polygons etc. density of solids, liquids and simple experimental determination center of gravity. Simple experiment for its determination. Magnetic defection theory photoconductivity demodulation principle.

		section & EHT. -Do- sound section -Do- power supply TV antenna – YAGI & feeder cables. Introduction to TV Cameras. Types of TV Cameras and its working principles. Types of Lenses, Operation & Mainte- Nance of TV Cameras				
89 to 95	Color TV	Expl. Of colour TV functi0onal Block diagram. Expl. Ckt. Description and test points of tuner. -Do- VIF. -Do-AFC -Do-AGC. -Do-Video Amplifier. -Do-Synchronization and Sweep ckt. -Do- Matrix.	Demonstration on CTV identification and use of diff. Controls. Identification, study and test points of tuner. -Do- VIF. -Do-Video Amplifier. -Do- sync. Ckt. -Do- Sweep ckt. -Do- picture tube -Do- sound sec. -Do- power	CTV (diff. Make) with manual. Colour pattern. Generator. Multimeter CTV demonstrato r. Oscilloscop e. Sweep generator with 'X-Y' display. Video film	Drawing of different tuner diagrams. VHF, UHF, Super Band, Hyper Band channels charts. Typical video IF response curves. Staggered tuned amplifier ckt. FM detector response curve. Sound section ckt. Diagram.	Qty. of heat, specific heat of solids, liquids and gases, heat gained heat lost. Problems on menstruation. Resolution and composition of forces. Principle of video rearding cutting and ben-ding of aluminum pipes principle and calculations for different channels. Calculation of frequencies due to channel interference. Calculation of video and sound IF frequencies for different

		-Do- Picture tube -Do- sound Sec. -Do- Power supply. Faultfinding. Adjustment of white colour. Introduction to Digital TV System and LCD TV and Principles of PIP. CCTV System	supply. Faultfinding. Adjustment of white colour. Demonstration of CCTV System.	'How CTV works'.		channels.
96 to 98	VCR ACD & VCD	Video track, writing speed Head gap, transport, slant Azimuth recording Video signal recor-ding, play back, stereo system. Block diagram of VCR, ACD, VCD, DVD Player and CD Writer. Familiarization of operation and maintenance of the above equipment. Expl. Of compact dis. System. Stereo system. Stereo	Adjustment/setup, serving, procedure, maintenance safety precaution.	DMM CRO, CTV, VCR, VCD, ACD. DVDCD Writer	Block diagram of CD player, VCR circuit diagram, ACD/DVD CD Writer	

		amplifiers. Arrangement of stereo for a specified area. Surround sound systems.				
99 to 100	Remote control system.	Block diagram of Hand held transmitting unit, explanation block diagram of receiving unit of RCU explanation,	Testing, voltage measurement, safety precaution etc.	DMM, CRO, and RCU.	Block diagram of both TX and R x of RCU.	
101 to 102	Project work					
103	Revision					
104	Examination					

LIST OF TOOLS AND EQUIPMENT FOR THE TRADE OF CONSUMER ELECTRONICS.

SL.NO.	DESCRIPTION	Instructors	Trainees.
	TRAINEES' KIT		**QTY.**
1.	COMBINATION PLIER 15 CMS INSULATED	1	20
2.	LONG NOSE INSULATED PLIER 15 CMS.	1	20
3.	DIAONAL CUTTER 15 CMS INSULATED	1	20
4.	END CUTTING NIPPER INSULATED 15 CMS.	1	20
5.	TWEEZERS 10 CMS INSULATED	1	20
6.	HEAT SINK PLIER	1	20
7.	TWEEZER	1	20
8.	NEON LAMP TESTER	1	20
9.	KNOB SCREW DRIVER INSULATED 10 CMS.	1	20
10.	SCREW DRIVERSET OF 6.	1	20
11.	KNIFE ELECTRICIAN	1	20
SHOP OUT FITS			
12.	ADJUSTABLE SPANNER/SLIDE WRENCH (15-20 CIS)		8
13.	WIRE STRIPPER		8 SETS
14.	ALLEN KEY		1 SET
15.	FIRST AID KIT		1 NO.
16.	ARTIFICIAL RESPONIRATION CHART		2 NOS.
17.	WORK BENCHES 120 X 400 X 75 CMS.		6 NOS.
18.	RUBBER MAT – 180 X 45 X 2.5 CM.		3 NOS.
19.	RUBBER GLOVES PAIR		1 SET
20.	STEEL RULER 30 CMS.		8 NOS.
21.	SCRIBER 15 TO 20 CMS.		4 NOS.
22.	CENTRE PUNCH 10 CM.		4
23.	HAMMER CROSSPANE 110 CM WITH HANDLE		4
24.	HAMMER BR PANE 220 CM WITH HANDLE		4

25.	SPANNERS DOUBLE ENDED METRIC SYSTEM 6 MM TO 19 MM BY 1.6 MM		4 SETS
26.	SPANNERS SINGLE ENDED 6 MM TO 25 MM BY 1.6 MM		2 SETS
27.	BOX SPANNER SET OF (4-15) MM		1 SET
28.	MALLET 8 PZ		2 NOS.
29.	GIMLET		2 NOS.
30.	SAW TENON 25 CM.S		2 NOS.
31.	CHISEL WOOD 15 CMS. SET OF 6 MM TO 25 MM		2 SETS
32.	CHISEL COLD FLAT 10 MM		2 NOS.
33.	HAND SHARES METAL CUTTING 25 CMS.		2 NOS.
34.	BRADAWL		2 NOS.
35.	RATCHET BRACE DRILL 10 M		2 NOS.
36.	ELECTRIC DRILL 10 MM WITH POLISHING AND BUFFING ACCESSORIES.		2 NOS.
37.	HACKSAW 20-25 CM (ADJUSTABLE)		4 NOS.
38.	HAND OPERATED BENDING BREAKE		2 SETS
39.	FLY PRESS – 4 TO 5 TON		1 NO.
40.	JUNIOR SAW 20 CMS.		2 NOS.
41.	FILE FLAT 20 CMS.		4 NOS.
42.	-DO- 15 CMS. BUSTARD		4 NOS.
43.	-DO- HALF ROUND 20 CMS. BUSTARD		4 NOS.
44.	-DO- ROUND 20 CMS. 2^{ND} CUT		4 NOS.
45.	-DO- FLAT 20 CMS.		4 NOS.
46.	INSTRUMENT FILES SET OF 12		2 SETS
47.	VICE BENCH 10 CMS JAW		2 NOS.
48.	-DO- 5 CM JAW		4 NOS.
49.	TAPS SET 3 MM TO 10 MM (SET OF 9)		2 SETS
50.	DIES SET 3 MM TO 10 MM		2 SETS
51.	SOLDERING IRON 25 W		20 NOS.
52.	-DO- 250 W		2 NO.

53.	-DO- 65 W		10
54.	-DO- 10 W		10 NOS.
55.	DESOLDERING PUMP		2 NOS.
56.	WIRE GAUGE SET.		2 NOS.
57.	FEELER GAUGE		2 NOS.
58.	PERMANENT BAR MAGNET 15 CMS.		2 NOS.
59.	SOLDENOID WITH CORE		2 NOS.
60.	HYDROMETER		2 NOS.
61.	RHEOSTATS ASSORTED VALUES AND RATINGS		25 NOS.
62.	VARIABLE RESISTANCES/POTENTIOMETER		25 NOS.
63.	DC/AC AMMETER 0 – 1 A.		2 NOS.
64.	-DO- 0-500 m A		2 nos.
65.	-DO- 0 – 100 m A		2 nos.
66.	-DO- 0 – 1 m A		4 nos.
67.	-Do- 0 – 5 m A		4 nos.
68.	DC/AC AMMETER 0-50 m A		2 NOS.
69.	DC/AC VOLTMETER 0-5 V		10 NOS.
70.	-DO- 0 – 10 V		10 NOS.
71.	-DO- 0 – 50 V		10 NOS.
72.	-DO- 0 – 500 V		4 NOS.
73.	-DO- 0 – 1000 V		2 NOS.
74.	LOUDSPEAKERS VARIOUS TYPES.		10 NOS.
75.	ELECTRIC BELL		20 Nos.
76.	BATTERY ELIMINATOR		20 Nos.
77.	MICROPHNE (ASSORTED)		4 NOS.
78.	HEAD PHONE, EARPHONE		4 EACH
79.	RECEIVER AERIAL KIT (INDOOR AND OUT DOOR)		2 NOS.
80.	TRANSISTORS (ASSORTED)		As Required
81.	ELECTRICAL COMPONENTS FOR ASSEMBLE		-DO-
82.	LOGIC PROBES		4 NOS.

83.	IC EXTRACTOR		4 NOS.
84.	TABLE LAMP		8 NOS.
85.	TV MIRROR		8 NOS.
86.	LINEAR ICs ASSORTED		AS REQUIRED
87.	DIGITAL ICs ASSORTED		AS REQUIRED.
EQUIPMENT:			
1.	ANALOG MULTIMETER BIG (SIMILAR TO SIMSON 260)		8 NOS.
2.	DIGITAL MULTIMETER (3 ½ Digit)		8 NOS.
3.	A.F. OSCILLIATOR		4 NOS.
4.	FREQUENCY MODULATOR		4 NOS.
5.	DUAL TRACE CRO (20 MHz)		5 NOS.
6.	LCR BRIDGE		2 NOS.
7.	SIGNAL GENERATOR AM/FM		4 NOS.
8.	FREQUENCY COUNTER		2 NOS.
9.	FUNCTION GENERATOR		2 NOS.
10.	COMMERCIAL AM/FM RECEIVER (TABLE TOP TYPE)		8 NOS.
11.	WATT METER 100W / 250V		2 NOS.
12.	P.A. AMPLIFIER		4 NOS.
13.	INSULATION TESTER		2 NOS.
14.	AUDIO OUTPUT METER		5 NOS.
15.	POWER SUPPLY 0-30 V/DC		4 NOS.
16.	POWER SUPPLY 0 – 300 V DC		4 NOS.
17.	DISTORTION METER/ANALYSER		2 NOS.
18.	COLOUR PATTERN GENERATOR		2 NOS.
19.	TAPE RECORDER STEREO TYPE		4 NOS.
20.	PULSE GENERATOR		2 NOS.
21.	TV RECEIVER (BLACK & WHITE & COLOUR) 4 EACH		8 NOS.
22.	COLOUR T.V. DEMONSTRATOR		1 NO.
23.	COLOUR TV CAMERA		2 EACH

24.	DIGITAL IC TESTER		1 NO.
25.	SIGNAL INJECTOR		4 NOS.
26.	BASIC ELECTRONIC TRAINER		8 NOS.
27.	LINEAR IC TRAINER		4 NOS.
28.	DIGITAL IC TRAINER		4 NOS.
29.	8085 MICROPROCESSOR TRAINING KIT		2 NOS.
30.	MICROPROCESSOR APPLICATION CARDS		1 SET
31.	VCR		4 NOS.
32.	ACD PLAYER		2 NOS.
33.	VCD PLAYER		2 NOS.
34.	DVD PLAYER		2 NOS.
35.	CD WRITER		1 NO.
36.	INTERCOM SYSTEM		1 NO.
37.	TELEPHONE PUSH BUTTON (PBT)		6 NOS.
38.	CORDLESS TELEPHONE (CLT)		6 NOS.
39.	CORDLESS MICROPHONE WITH AMPLIFIER		2 NOS.
40.	COLAR MICROPHONE		2 NOS.
41.	TELEPHONE SYSTEM TRAINER		1 NO.
42.	CAR STEREO HAVING AUTO REVERSE SYSTEM		6 NOS.
43.	WOBBULATOR		2 NOS.
44.	ELECTRIC IRON (AUTOMATIC)		2 NOS.
45.	ELECTRIC IRON (AUTOMATIC WITH WATER SPRAY)		2 NOS.
46.	WASHING MACHINE (MICROPROCESSOR/ MICROCONTROLLED BASED)		1 NO.
47.	INVERTERS 500 KVA WITH BATTERIES		2 NOS.
48.	LEAD ACID BATTERIES		2 NOS.
49.	MAINTENANCE FREE BATTERIES		2 NOS.
50.	P-IV COMPUTER WITH MULTIMEDIA		2 NOS.
51.	DOT MATRIX PRINTER		1 NO.
52.	MICROWAVE OVEN		1 NO.

53.	OVERHEAD PROJECTOR WITH SCREEN		1 NO.
54.	MEGGER		2 NOS.
55.	TEMPERATURE CONTROLLED SOLDERING STATION		4 NOS.
56.	TEMPERATURE CONTROLLED DE-SOLDERING STATION		2 NOS.
57.	VARIAC 500 VA		4 NOS.
58.	ISOLATION TRANSFORMER 500 VA		2 NOS.
59.	FRACTIONAL H.P. AC MOTORS		2 NOS.
60.	FRACTIONAL H.P. DC MOTORS		2 NOS.
61.	COIL WINDING MACHINE (MANUAL)		1 NO.
61.	BATTERY CHARGER 25V/10A		1 NO.
62.	HIGH RATE DISCHARGE TESTER		1 NO.
63.	GRINDER BENCH ELECTRIC		1 NO.
64.	STOOLS		20 NOS.
65.	COMPUTER TABLE		1 NO.
66.	COMPUTER CHAIR		1 NO.
67.	TEACHER CHAIR & TABLE (ONE EACH)		2 NOS.
68.	STEEL CABINET 120 x 60 x 45 Cms		6 NOS.
69.	STEEL LOCKERS WITH 16B DRAWERS		4 NOS.
70.	SLOTTED ANGLE RACK (4 SHELF)		5 NOS.