SYLLABUS FOR THE TRADE OF

TEXTILE MECHATRONICS

UNDER

CRAFTSMEN TRAINING SCHEME

DESIGNED IN
2006

GOVT. OF INDIA
MINISTRY OF LABOUR & EMPLOYMENT
CENTRAL STAFF TRAINING & RESEARCH INSTITUTE
EN BLOCK, SECTOR V, SALT LAKE CITY
KOLKATA –91

List of Members attended the Trade Committee Meeting held on 18.07.2006 at CSTARI, Kolkata for designing of syllabi for the Trade of 1) Spinning Technician, 2) Weaving Technician, 3) Textile Mechatronics and 4) Textile Wet Processing (Textile Group of Trades) under CTS.

SL.NO.	NAME	DESIGNATION & ORGANISATION	
1.	Shri G.Bhowmik	Director, CSTARI, Kolkata	Chairman
2.	Dr. S.M. Chatterjee	Advisor, Tech. Edu., Govt. of W.B., Kalyani	Member
3.	Dr.A.K.Samanta	Instt. of Jute Technology, Kolkata	Member
4.	Prof. Swapan Kr. Ghosh	Instt. of Jute Technology, Kolkata	Member
5.	Dr. Satyaki Bhattacharyya	Kalyani Govt. Engg. College, Kalyani	Member
6.	Shri T.Sundararaj	Commissioner of Emp.&Trg., Chennai-32	Member
7.	Shri S. Mondal	Dy. Director, ITI Gariahat	Member
8.	Shri S.S.Pal	Kalyani, Spinning Mill	Member
9.	Dr. S.K.Mandal	NITTTR, Kolkata	Member
10.	Shri P.Sengupta	Jaya Shree Textiles, Rishra-712249	Member
11.	Shri Sunanda Mitra	Apparel Export Promotion Council	Member
12.	Shri Amitabha Ray	Kalyani Spinning Mill	Member
13.	Shri T.Mukhopadhyay	Dy. Director Of Trg. CSTARI, Kolkata	Member
14.	Shri A.Chakraborty	Asstt. Director of Trg. CSTARI, Kolkata	Member
15.	Shri R.B.Ram	Asstt. Director of Trg. CSTARI, Kolkata	Member
16.	Shri S.B.Sardar	Training Officer, CSTARI, Kolkata	Member
17.	Shri P.K.Kolay	Training Officer, CSTARI, Kolkata	Member
18.	Shri R.N.Manna	Training Officer, CSTARI, Kolkata	Member

GENERAL INFORMATION

1. Name of the Trade : Textile Mechatronics

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

3. Entry Qualification : Passed 10^{th} Class Exam.

4. Duration of Craftsmen Training : 2 Years.

5 . Space Norms : 240 Sq.Meter

SYLLABUS FOR THE TRADE OF TEXTILE MECHATRONICS
DURATION – 2 YEARS

SEMESTER - I	Total – 26 weeks	Week No. – 1 to 26.

Week No.	Practical	Theory	Engineering Drawing	Workshop Calculation & Science
1.	Demonstration about artificial respiration and common defects practices for workshop	Industrial safety precautions-safety devices, safety signs. First aid- Fire Extinguishers	Importance of Engg. Drawing Methods of drawing- Instruments and equipments uses in Engg. Drawing.	Conductors and insulators –Materials used- properties Matter, Molecules, Atom, Atomic particles, Principles of electricity fundamental terms in electricity.
2.	To connect VM, AM in a simple low voltage DC circuit and measure the current & voltage.	Fundamentals of electrical terms and definitions with their units- Symbols –Effects of electricity, conductor-Insulator-Semi conductor-Type of cables.	Types of lines- their meanings, applications as per IS: 696	Semiconductors, conductors, insulators phenomena and materials uses.
3 & 4	Skinning the cables and different joint practice- in single & milti strand cables. To verify the characteristics of series and parallel circuit. Measurement of power and energy.	Work power and energy (P.E and K.E) Ohm's Law series and parallel circuit with simple problems.	Simple conventional symbols for material and parts as per IS: 696.	Properties and uses of copper, aluminium, solder, rubber.

5.	Grouping of cells for required voltage and current charging of secondary cells.	Primary cells-Types of cells Defects-Applications secondary cells. Types of cells types of charging , care and maintenance.	Construction for geometrical drawings angles and triangles.	Applied workshop problems involving multiplication, division, addition and subs traction. Common fraction-Addition, subtraction, multiplication and division-Reduction of common fractions of decimals fractions using BODMAS Rule.
6.	Tracing of magnetic field preparation of solenoid and vary its strength.	Magnet-its terms-Electromagnet –Their Applications-Electro magnetic induction Faraday's Law-Lenz's Law.	Geometrical construction of Rectangle – Square-Triangle-circle.	Decimals-Addition, subtraction, multiplication and division-Conversion of decimals to common fractions-Using BODMAS rule.
7.	Identification of terminal connections, Build up the voltage.	D.C generator-Construction- Working principle-Types of generator and applications.	Geometrical construction of polygons and ellipse, parabola and hyperbola.	C.G.S, M.K.S and FPS systems of units of length, mass, weight, capacity, pressure density-unit of power –SI units.
8.	Starting, running & maintenance of different motors.	Different types of motors, AC/ D.C motor-Construction-Working principle-Types application necessity of starter-Types. Different types of Pump motors.	Geometrical construction of involutes, oval and helix,. Reviewing the various geometrical constructions.	Percentage simple calculation direct and inverse proportions.
9.	One lamp controlled by one way / two way switch, to wire up for one lamp and one socket undependably, to prepare a test board.	Wiring-Types of wiring-Application of different types of wiring-Wiring accessories- Materials-Ear thing.	Free hand practice on printing style for standard letters and numbers.	Mechanical properties of metal –Purpose of heat treatment-Annealing, normalizing, hardening and tempering procedure and uses.
10.	To measure the current voltage P.F. Frequency, power of a simple A.C circuits. To verify the characteristics of RLC series and parallel circuit.	Fundamental terms in A.C circuits –types of A.C circuits-P. F-advantages of good P.F disadvantages of poor P.F- improvement of P.F	Free hand practice on printing style for standard letters and numbers.	Calculation of speed, velocity and acceleration-Definitions and units.

11.	To verify characteristics of star delta connections. Measure the power and energy of three phase load.	Poly phase star and delta connections-line voltage-phase voltage-line current-phase current.	ISI symbols of Elect. Engg.	Newton's law of motion difference between mass & weight. Definition and simple calculation of work, power and energy.
12.	Identify the terminals of Alternator & buildup the voltage.	Alternators-Construction-working principle – voltage regulations-phase sequence	ISI symbols of Elect. Engg.	Algebra-addition subtraction, multiplication & division. Standard algebra formulas, solving simple equations.
13.	To start, run and reverse different types of single phase motor.	A.C motor-Single phase motor working principle-types.	Base print reading of connecting to motors thru' Ammeter Voltmeter and K.W meter.	Equation with two unknown quantities . Equation in various parenthesis.
14.	To start, Run and reverse different types of three phase motor with different types of starters.	Three phase motor working principle –types starter and their types.	CKT diagram of battery charging with all details of panel board	Standard algebraic expressions solving simple equations.
15.	Identify the terminals of transformer. Measure the primary & secondary voltage and respective currents.	Transformer-principle-types & their application.	Free hand sketching simple object layout arrangement of DC generators control panels.	Solving simple & complex simultaneous equations. Workshop based problems
16.	**DEMO**: The type of meters-measure the insulation value with megger.	Instruments-V.M, A.M, W.M, E.M-types-connections. Megger and application	Free hand sketching simple objects layout arrangement of DC generators control panels.	Definition and application & Rules to find log of a number, Method of referring log and antilog table practice.
17.	Connect and test F.T, M.V / S.V lamps & energy efficient lamps. Norms for illumination in textile mills	Illumination – incandescent lamp-fluorescent lamp-M. V lamp- connections-applications care and maintenance.	Graphic symbols for rating M/c & Transformers	Log of simple and decimal fraction. Basic operations involving logarithm in the computation.
18.	Fault finding, rectification and	Working and maintenance of domestic	Sketching of DC 3 point & 4	Complex fraction using logarithm. Square root and

	servicing of different types of domestic and Industrial appliances.	and Industrial appliances-heaters/Furnaces/Pump set.	point starter to scale.	exponents calculation using logarithm.
19.	**ELECTRONICS:** Soldering & Desoldering practice Identifying simple meters-Study the multimeter Vefification of Ohm's law. Identification and testing the given components-Study of the color code of Resistors.	Conductor, insulator,, Semiconductor, types of solder, Types of fluxes methods of soldering Resistors, Capacitors, inductors etc. Types specification and their applications. Study of solid state device such as diodes, transistors SCR and Ics.	ISI symbols of Electronics Drawing UJT triggered circuit.	Definition of friction-related terms-types-problems-friction plain and inclined surfaces .Advantages & disadvantages principles. Co-efficient of friction ways of reducing friction . Advantages of friction-calculation of mechanical advantages V.R. and mechanical efficiency.
20.	VI characteristics of diode Half wave & Full wave rectifier.	Semiconductor theory P-type and N-Type Semiconductors. Diode-Constructions working rectifiers, filters.	Power amplifier circuit with FBT.	Density: difference between density and relative density-pressure and thrust-Archimedes principle-Standard and gauge pressure
21.	Voltage regulator circuit-Input-Output characteristic of Transistors at common base-common collector-common emitter modes. Study of Integrated (IC) circuit , Construction of Transistors & Amplifiers. VI characteristics of SCR-speed control of D.C motor using SCR. FET amplifier Ckts. UJT relaxation oscillator.	Transistors-construction working amplifier circuits SCR, FET, UJT, DIAC & TRAIC constructions working applications circuits. Study of Integrated (IC)	Remote control by IS & MS block diagram of microprocessors.	Mensuration calculation of area of square, rectangle, triangle, circle and regular polygon. Calculation of perimeter of above.
22.	Study of different logic gates. Testing of gates using Ics-Constructions of Timer circuits using 555 Ics.	Introduction to logic gates. Explanation of basic logic gates, OR, AND, NOT, NOR AND , EX - OR etc. Truth table	Introduction to CAD/CAM and drawing simple component drawing on	Calculation of volume and weight of simple solids-cube, cuboids, cylinder, sphere. Heat- conversion of

		using diodes, transistors, resistors. Logic gates using etc. Flip-Flops-Counters, Timer circuits.	CAD (2 components). Free hand sketching of O/S, micrometer, vernier & Trade related tools.	centigrade to Fahrenheit scale Heat transmission and effects of heat-difference between heat and temperature
23.	Simple programming through microprocessor kit	Microprocessor – working principle & block diagram	Do	
24.	Study of commonly used Transducers	Transducers-thermocouples, thermistors, LDRS, LVTs strain gauges, magnetic pickup photo diodes, photo tranistor. Over current relays, D.C Motor controllers photo electrical relays.	Free hand sketching of O/S, micrometer, vernier & Trade related tools.	Conversion of binary to decimal and decimal to binary –Octal to decimal and decimal to Octal binary to Hexadecimal and Hexadecimal to binary.
25.	Demonstration of various controlling units. Comparisons of PLC with conventional machine control. Functions of keys on programme-Development Terminal (PDT).	Concept of PLC Block diagram comparison of PLC with conventional terminal / relay. Function of various programmes development terminal (PDT)	Free hand sketching of O/S, micrometer, vernier & Trade related tools.	Electricity, current, Resistance potential difference, emf-definitions and calc- ulations-Ohm's law-laws of resistance.
26	Class Test	Class Test	Class Test	Class Test

SEMESTER - II	**Total – 26 weeks**	**Week No. – 27 to 52.**

27.	Elementary training in Basic Manufacturing Methods (welding & press shop), identification of mechanical, electrical &electronics components of	**INTRODUCTION** Objectives of blow room-identification of components of the machine, & and its functions	Interconvention of isometric, oblique drawings of and vice versa.	Stress, strain and modules of elasticity Calculation-Factor of safety.

	the machine, setting & maintenance			
28-29.	.Identification of mechanical, electrical &electronics components of the machine, setting & maintenance. Elementary training in rotating machinery division, electric motor assembly section.	Objectives of carding-Working mechanism of carding- Identification and importance of components in carding.	Interconvention of isometric, oblique drawings of and vice versa	Specific resistance-definitions and calculations- series and parallel connection – calculation of resistance and current.
30	Study of industrial safety, precautions and first6 aid methods. .Identification of mechanical, electrical &electronics components of the machine, setting & maintenance.	Objectives and working of lap formers &Comber-identification of machine components and its functions	Interconvention of isometric, oblique drawings of and vice versa	Calculation of electric power and electric energy.
31.	Identification of mechanical, electrical &electronics components of the machine, setting & maintenance. Elementary training in heavy engineering division, machine shop and tool room section.	Objectives and working Draw frame-identification of machine components and its functions	Interconvention of isometric, oblique drawings of and vice versa	Problems related to the trade using logarithm tables.
32.	Elementary training in assembly section.	Objectives and working Speed frame-Simplex-spinning-working Mechanism.	Interconvention of isometric, oblique drawings of and vice versa	Fundamental geometrical definition angles and properties of angles, triangles, properties of triangles.
33-34.	Study of various methods for transporting materials and machines of various sizes	Auto cone Winding-Sequence of Process-Mechanism of Cone/cheese-winding-Working principle and operation.	Orthographic view of simple solids	Pythagoras therein, properties of similar triangles.
35-36.	Study of wiring methods and perform an experiment to control one lam by one single way switch and 3 pin	Application of Mechatronics in Blow room & Carding. Electrical and electronics	Diagram of control panel with circuit diagram of relevant machine	Rectangle, square, Rhombus and Parallelogram and their properties.

	wall socket with switch control	involved in Blow room – regulation of cotton flow-detection of foreign particles		
37.	Advanced wiring of a switch control board and panel	Coiler-stop motion units-Electric motors-working-principle of operation-introduction to electric drives-drives involved in textile machines and their importance	Diagram of control panel with circuit dia.	Circle and properties of circle and regular polygons
38.	Demonstration of the winding and testing of an AC relay coil	Can changer mechanism, principle of autoleveller, importance and its functions,control systems involved in autoleveller,production & monitoring system	Diagram of control panel with circuit dia. of relevant machine.	Specific heats of solids & liquids, quantity of heat.
39-40.	Demonstration the winding and testing of a single phase transformer	APPLICATION OF MECHATRONICS IN COMBER, DRAW FRAME, LAP FROMERS AND SPEED FRAME: Working principle of Comber- starting mechanism-Electronics involved in Doffing operation- Draw frames	Diagram of control panel with circuit diagram of relevant m/c	Heat loss and heat gain with simple problems.
41-42.	Experiment to connect the end connections of a 3-phase induction motor.	Working principle of Speed frames-controls system in speed frame machines-Cone drum mechanism	Diagram of control panel with circuit diagram of relevant m/c	Solid figures: TSA and CS of Prism, cylinder, Pyramid Cone.
43-44.	Study of feedback elements and control elements	Introductions to Hydraulics-application of hydraulics in textile machines. Fluid couplings-Drive tech-Waste Evacuation system	Diagram of control panel with circuit diagram of relevant m/c	Trigonometry: Definition Trigonometrical ratios use of Trigonometrical table
45-46.	Determination of settings, speeds, production,	Spinning-working principle of pneumatic	Diagram of control panel with circuit	Angular measurement, units

	efficiency and machinery particulars for carding	speed variator-doffing sequence-electronics in doffing sequence.	diagram of relevant m/c	relationship, finding out sides and angles.
47-48.	Determination of settings, speeds, production, efficiency and machinery particulars for draw frame	Importance of over head cleaners and their operation-drives, motors sensors and transducers operations in over head cleaners	Diagram of control panel with circuit diagram of relevant m/c	Trigonometrical ratios and identifying signs by Quad ram method.
49-50.	Determination of settings, speeds, production, efficiency and machinery particulars for speed frame	Importance of OE Spinning-electronic controls- drives, motors and mechanism in OE Spinning	Diagram of control panel with circuit diagram of relevant m/c	Trigonometrical ratios for well known angles Problems, using important formulae.
51.	Determination of settings, speeds, production, efficiency and machinery particulars for spinning & winding.	Principle of Winding-electronic controls in Auto corner –Principle of conveyor operation	Diagram of control panel with circuit diagram of relevant m/c	Trigonometrical values for any angle using Trigonometrical data
52	Class Test	Class Test	Class Test	Class Test
SEMESTER - III		**Total – 26 weeks**		**Week No. – 53 to 78.**

53-55.	Determination of settings, speeds, production, efficiency and machinery particulars for yarn preparatory machine Identification of mechanical, electrical &electronics components of the machine, setting & maintenance. Determination of settings, speeds, production, efficiency and machinery particulars for yarn preparatory m/c	Principles of yarn preparatory m/c.	Orthographic views of complicated blocks (both of taper & curve) Circuit diagram of relevant m/c	Finding Altitude distance by trigonometry. Calculation of load cell, cross head chart ratio
56-57.	Determination of settings, speeds, production, efficiency	Principles of knitting & weaving machine	Orthographic views of	Cells & Batteries and

	and machinery particulars for knitting & weaving machine. Identification of mechanical, electrical &electronics components of the machine, setting & maintenance.		complicated blocks (both of taper & curve)	related problems.
58-61.	Handloom & Power loom Turning & setting & production & running. Identification of mechanical, electrical &electronics components of the machine, setting & maintenance.	Working principles of different types of looms.	Classification of faults, electronic clearer setting	Centre of gravity-Equilibrium – condition of equilibrium
62-63.	Study of constructional features of pneumatic components, using cut-section models and demonstration KIT.	PNEUMATIC AUTOMATION IN TEXTILE MACHINES: Introduction to pneumatics-application of pneumatics in blow room	Tool post for the lathe with washer and screw	Graphs: Abscissa and ordinates, graphs of straight line, related to two sets of varying quantities
64-65.	Simulation of circuits using Festo trainer kit	Pneumatic controls in carding machine-components involved and their control systems	Sketches for simple pipe unions with a simple pipe line drawings.	Mechanical properties of metals.
66-67.	Simulation of multiple actuator systems	Pneumatic controls comber M/C components and its functions and identification of basic components	Sketches of DC Motor and its pats.	Physical properties and chemical properties of metals.
68-69.	Simulation of electro-pneumatic systems	Pneumatic controls silver lap and ribbon lap former-components involved and their control systems.	Sketches of M.I. Instruments	Heat treatment of steel hardening, annealing, tempering, normalizing, etc.
70-71.	Simulation of electro-pneumatic systems employing proximity switches, optical sensors and capacitive sensors	Pneumatic controls drawing machines and ring frames components involved and their basic operations	Concept of preparation of assembly drawing and detailing	Transmission of power by belt pulleys & gear drive.
72-	Simple circuits using hydraulic	Pneumatic controls	Simple assemblies	Transmission

73.	elements	winding machines-components involved and their control systems	& details of trade related tools/jobs/exercises with dimensions the given sample or models.	of power by belt pulleys & gear drive.
74-75.	Identification of PLC blocks and simple experiment on PLC	INTRODUCTION TO ADVANCED AUTOMATION SYSTEM: Introduction to PLC and their programming methods-block diagram of PLC-working of PLC-Input and output units.	Simple assemblies & details of trade related tools/job/exercises with the dimensions form the given sample or models.	Importance of statistics: Measures of location Arithmetic mean, Median, Mode, Geometric mean and Harmonic mean.
76-77.	PLC based electronic controls	Role of PLCs in textile industries-programming examples-logic gates	Details and assembly of Vee-Blocks with damps	Measures of Dispersion: Quartile deviation, Mean deviation, standard deviation
78	Class Test	Class Test	Class Test	Class Test

SEMESTER - IV	**Total – 26 weeks**	**Week No. – 78 to 104.**

79-80.	Introduction to HMI (Human m/c Interface)Software	Role of HMI panels in textile industries-hand held operating system	Sketches of M.C. Instruments	Co-efficient of regression- Related problems.
81-92.	Calculation, setting of modern spinning & weaving machines. Identification of mechanical, electrical &electronics components of the machine, setting & maintenance.	Introduction to working of modern spinning & weaving machine	Diagram of relevant m/c	Do.
93-	Calculation of speed, production and	Working of flat /	Blue print	Relative Pressure-

94.	study of different mechanisms of flat / circular machines. Identification of mechanical, electrical &electronics components of the machine, setting & maintenance.	circular knitting machine- control, Operations and their importance	reading to missing lines	Static Pressure-Pressure Gauges.
95-98.	Industrial Visit & Inplant training in production & machine maintenance	Industrial Visit	Industrial Visit	Industrial Visit
99.		Quality concept, ISO9001-2000, SA8000, ISO14001-2004, 5S system, OHSAS18001-1999	Blue print reading. Simple exercises related to missing sections	
100-101.	Industrial safety & Health hazard			
102-103.	REVISION	REVISION	REVISION	REVISION
104.	TEST	TEST	TEST	TEST

1. List of Equipments and Machinery :

S. No.	EQUIPMENTS	QUANTITY (No.)	COST (Rs.)
1.	Ammeter 1 MA to 500 MA	1	2,000
2.	Ammeter 0 to lamp D.C	1	1,800
3.	DC ammeter (0-5) A	4	8,400
4.	Ammeter (0-50) mA	3	2,400
5.	AC ammeter (0-10)A	4	8,400
6.	DC voltmeter (0-250)V	4	8,400
7.	Millivoltmeter 100-0-100 m Volt	1	2,200
8.	Digital voltmeter	3	6,180
9.	AC Voltmeter (0-300)V	2	5,300
10.	AC voltmeter (0-600)V	1	2,100
11.	AC Voltmeter M.I. 0-500V	1	2,000
12.	KW meter 0 to 1 K.W. capacity 1:2	1	3,000
13.	Single phase power factor meter	1	1,000
14.	Frequency meter	1	400
15.	AC Energy meter (single phase 5A 230V)	1	20,000
16.	Megger 500 volts	1	1,500
17.	Fan DC 220 Volt 1200 mm	1	800
18.	Electric hot plate 150 Watt. 220V with temperature control	1	500
19.	Electric kettle, 1000 watts. 230 V	1	500
20.	Immersion heater 750/1000/1500W-230V	1	200
21.	Series type ohm meter 0-2000 approximate	1	2,000
22.	Shunt type ohm meter 0-25 approximate	1	1,500
23.	3-point DC starter1	1	250
24.	4-point DC starters	1	250
25.	Cut out, reverse current over load voltage relays	1	1,000
26.	Starters 3-phase, 400V, 50 cycles, 2 to 5 H.P. AC motors	1	450
27.	Auto transformer type starter	1	5,000
28.	Star delta starter with manual, semi auto & Automatic	1	1,000
29.	Direct on line starter	1	
30.	Multimeter	1	15,000
31.	Motor generator set consisting of: Motor shunt 5HP, 440 Volts with starting Compensator and switch directly coupled to generator A.C 3.5 KVA, 400/230 Volts, 3-phase, 4 wire, 0.3 PF 50 cycles with exciter and 1 switch Board mounted with regulator circuit breaker, ammeter, voltmeter frequency meter, knife blade switch and fuses etc,., set complete with cast iron bed plate, fixing blots, foundation bolts & flexible coupling	1 complete	20,000
32.	Motor shunt DC, 220 volt, 2 to 3 H.P.	1	10,000
33.	Motor AC Single phase, 230 volt, 1 H.P. repulsion type with starter and switch	1	10,000
34.	Motor AC Single phase 230 volt, 50 cycles series type with starter/switch H.P.	1	10,000
35.	Current transformer	1	20,000
36.	Potential transformer	1	
37.	Variable auto transformer 0-250 V 5 apms	1	
38.	Single phase resistive load 3 KW	1	20,000

39.	Three phase resistive load 10 KW		
40.	Motor generator set consisting of: Motor Induction squirrel cage, 7 HP 400 volts, 50 cycle 3-phase with star delta starter and switch directly coupled to DC shunt generator, 5 KW 400 volts, switch board mounted with regulator, air circuit breaker, ammeer, voltmeter knive blade switches and fuses, set complete with cast iron and plate, fixing blots. Foundation bolts and Flexible coupling.	1 complete set	10,000
41.	Motor of AC squirrel cage, 3-phase 400 volt, 50 cycles, 2 to 3 HP with star delta starter.	1	20,000
42.	Motor AC phase-wound slip ring type 5 HP 400 volts, 3-phase, 50 cycles with starter and switch	1	20,000
43.	Soldering Iron set with temp control	1	1,500
44.	Soldering Iron	1	250
45.	Desoldering pump	1	100
46.	RPS	3	4,500
47.	CRO	1	25,000
48.	PLC trainer	1	1,00,000
49.	AF Oscillator	1	7,500
50.	Foam extinguisher	1	500
51.	Dry extinguisher (powder)	1	500
52.	Carbon dioxide Extinguisher	1	300
53.	Sand bucket	1	75
54.	Dry c ell	1	300
55.	Lead Acid battery 12 V, 10 AH	1	500
56.	Rheostat 50 ohms` /5A	4	18,00
57.	Ceramic Resistor (10 ohms, 22 ohms, 68 ohms, 100 ohms, 47 ohms)	3 set	750
58.	Load resistance	1 set	3,850
59.	Resistor (58 k ohms, 2 ohms, 100 ohms)	1 set	2,100
60.	Rhcostat (750 ohms, 1.2 ohms)	1 set	1,540
61.	Capacitor (60 uF)	1 set	900
62.	Inductor(95 Mh)	1 set	
63.	Wiring Tool kit	3	5,000
64.	Sodium vapour lamp	2	10,000
65.	Mercury lamp	2	10,000
66.	Megger Earth electrode (25 million to 1550 ohms)	1	5,000
67.	Festo Trainer Kit	1	80,000
		Total:	**4,11,695**

2. List of Tools :

Sl. No.	Name of the Tools	For Trainees	For Instructor	Cost (Rs.)
1.	Combination Pliers 200 mm insulated	20	1	3,150.00
2.	Screw Driver 200 mm	20	1	420.00
3.	Screw Driver 100 mm	20	1	260.00
4.	Terminal Screw Driver	20	1	200.00
5.	Hammer Ball Pein (0.25 kg)	20	1	630.00
6.	Try Square (200 mm)	20	1	1140.00
7.	File round (half) 2” cut 250 mm	20	1	1370.00
8.	File round 150 mm	20	1	1260.00
9.	Plumb Both115 gm.	20	1	530.00
10.	Barwood Mallet 1 Kg. (75 mm X150 mm)	20	1	315.00
11.	Knife	20	1	105.00
12.	Wood rasp file 250 mm	20	1	1890.00
13.	Firmer chisel 12 mm	20	1	740.00
14.	Firmer chisel 6 mm	20	1	600.00
15.	Neon Tester	20	1	420.00
16.	Tenon saw 250 mm	20	1	1575.00
17.	File flat 25 cm.2 nd cut	20	1	1260.00
18.	File flat25 cm. Smooth	20	1	1575.00
19.	Steel Rule 300 mm to read Metric	25	1	520.00
20.	Test lamp	20	1	630.00
21.	Circlip Opener	20	1	1575.00
22.	Continuity Tester	20	1	1050.00
23.	Glouse	20	1	5250.00
24.	Insulating Tape	20	1	125.00
25.	Electrical soldering Iron	20	1	210.00
			Total:	**26,800.00**

3. List of Shop General Outfit:

Sl.No.	Name of the Tools & Equipments	Quantity	Cost (Rs.)
1.	Pliers side cutting 200 mm	10	100.00
2.	Pliers Flat nose 150 mm	5	450.00
3.	Pliers round nose	5	450.00
4.	Pliers long nose	10	900.00
5.	Screw driver heavy duty 250 mm	10	350.00
6.	Screw driver7 mm X 300 mm Square blade	10	400.00
7.	Firmer Chisel 25 m	10	650.00
8.	Firmer Chisel 10 mm	10	650.00
9.	Marking Gauge	5	375.00
10	Combination bevel Protractor	3	5100.00
11.	Cold Chisel flat25x200 mm	4	200.00
12.	Cold Chisel flat18 X200 mm	4	160.00
13.	Hammer Ball Pein 0.5 kg.	5	225.00
14.	Hammer Ball Pein 0.75 kg.	5	300.00

15	Hammer Ball Pein 1 kg.	5	375.00
16	Hammer Cross Pein 0.5 kg.	5	250.00
17.	**Wall jumper Octagonal** 37 mmX450 mm, 37 mmX600mm	2 each	100.00
18.	Centre Punch 100 mm	5	50.00
19.	File flat300 mm rough	5	400.00
20.	File flat300 mm 2 nd. Cut	5	450.00
21.	File flat 250 mm Bastard	5	400.00
22.	File flat250 mm smooth	5	400.00
23.	File half round300 mm 2 nd cut	5	650.00
24.	File Triangular 150 mm 2nd cut	4	360.00
25.	Spanner double ended set of 6	5 sets	150.00
26.	Adjustable Spanner 350 mm	2 sets	120.00
27.	Foot Print grip 250 mm	2 set	150.00
28.	Allen keys (Metric & Inches	20 sets	4000.00
29.	Steel Rule 30 cm	5	100.00
30.	Steel Measuring Tape (2 m)	5	185.00
31.	Steel Measuring Tape (20m)	2	150.00
32.	Hacksaw frame Adjustable 200 mm t0 300mm	5	375.00
33.	Spirit level 300 mm	3	1500.00
34.	Bench vice 150 mm	3	2700.00
35.	Bench vice 100 mm	2	1000.00
36.	Pipe Wrench (300 mm)	10	1000.00
37.	Spanner (up to 32 mm)	10	1500.00
38.	Vernier caliper	2	1000.00
39.	Ring spanner	3 set	500.00
40.	12” grip Plier	4	200.00
41.	Inner caliper	5	90.00
42.	Outer caliper	5	90.00
43.	Box spanner	4 set	600.00
44.	Torque spanner	3	450.00
45.	File Swiss type needle set	5	225.00
46.	Shore hardness tester for rubber	1	1500.00
47.	Needle file	3 set	180.00
48.	Nylon hammer	5	180.00
49.	Puller 2 arm , 3 arm	3 each	225.00
50.	Copper tube cutter	3	250.00
51.	Ratchet brace 6 mm capacity	5	8000.00
52.	Ratchet bit 4 mm and 6 mm	5	750.00
53.	Vernier Caliper 200 mm (ordinary)	5	1000.00
54.	Snips	5	375.00
55.	Conduit Pipe die set	5	3000.00
56.	Tong Tester	2	3000.00
57.	Ohm meter	2	3000.00
58.	Grimping tool (Manual)	1	1000.00
59.	Blow Lamp	2	300.00
60.	Multimeter	2	2000.00
61.	Ladle	5	500.00
62.	Pipe Vice 18”	2	1500.00
		Total Rs.	55790.00