SYLLABUS FOR THE TRDE OF

TEXTILE WET PROCESSING TECHNICIAN

(Replacing the old Syllabus for the trade of "Bleaching, Dying & Calico Printing"
Under craftsmen Training scheme for the Period of one year)

Under
CRAFTSMEN TRAINING SCHEME

REVISED IN
2008

GOVT. OF INDIA
MINISTRY OF LABOUR & EMPLOYMENT
CENTRAL STAFF TRAINING & RESEARCH INSTITUTE
EN BLOCK, SECTOR - V, SALT LAKE CITY,
KOLKATA – 700 091

List of Members attended the Trade Committee Meeting held on 18.07.2008 at CSTARI, Kolkata for designing of syllabi for 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 WET PROCESSING TECHNICIAN** (Replacing old trade named as Bleaching, Dyeing & Calico Printing)
2.	N.C.O. No.	: 758.90
3.	Duration of Craftsmen Training	: Two Years
4.	Entry Qualification	: Pass in 10th class examination under 10 + 2 system of education with Science and Maths or its equivalent.
5.	Rebate of Ex-Craftsmen Trainees	: Nil
6.	Ratio of Apprentice of worker	: 1:4

Syllabus For The Trade Of

TEXTILE WET PROCESSING TECHNICIAN
Under the CRAFTSMEN TRAINING SCHEME

DURATION OF TRAINNING – 2 YEARS

PART – I: (1st and 2nd Semester)

1st Semester	General Basic Training of Technician for 6 months (SEMESTER – I) Fitting – 8 weeks, Turning – 4 weeks, Carpentry – 2 weeks, Sheet metal work – 3 weeks, Welder – 2 weeks, Electrical – 4 weeks, Electronics – 3 weeks. **(WEEKS – 1 to 26)**
2nd Semester	General, Fibre Studies, Preparatory Chemical Processing, Introduction to Mechanical and Chemical Finishes, Lubrication and maintenance of relevant machines. **(WEEKS – 27 to 52).**

PART – II: (3rd and 4th Semester)

3rd Semester	Utilities, Energy conservation, Dyeing of different textiles, Trouble shooting in dyeing & Dyeing machines **(WEEKS – 53 to 78).**
4th Semester	Colour Science, Tests of Colour fastness & Colour Matching in Dyeing. Printing, Screen making and Trouble shooting in Printing etc. **(WEEKS – 79 to 104).**

PART – I: (1ST AND 2ND SEMESTER): SYLLABUS FOR RELATED TRADE THEORY AND PRACTICAL FOR TEXTILE WET PROCESSING TECHNICIAN COURSE

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

WEEK NO.	PRACTICAL	THEORY	ENGINEERING DRAWING	WORKSHOP CALCULATION & SCIENCE
1.	**FITTING:** Filing Practice	Trade instruction-safety-types of safety-workshop safety-Hand Tools safety-personal safety. Hand tools – Types of hand tools – Types of vices – specification – uses, care and maintenance	Importance of Engg. Drawing – Methods of drawing – Instruments and equipments-uses in Engg. Drawing	Fraction Decimals Basic Arithmetic Operations – Addition and Subtraction
2.	Filing to size and chipping	Accident – Prevention – Machine – men –Industry – Marking tools – calipers – dividers – Surface plates – Angle plates – Scribers – punches – surface gauges – Types – Uses, Care & maintenance.	Types of lines – their meanings, Applications as per IS: 696	Fraction & decimals: Basic Arithmetic Operations – Multiplication – Divisions – Complex Problems of basic operations
3.	Marking and Punching	Cutting tools-Files – Chisels – Hacksaw blades – Scrapper – Various cutting angles and their uses – care & maintenance – specification steel flats & strips – specification of steel angle – specification of steel sections	Simple conventional symbols for material and parts as per IS - 696	Properties & Uses of Metals and Non-metals.
4.	Open fitting of sized metals	Measuring tools – Precision and non-precision – steel rule – calipers – Vernier caliper – micrometer – Vernier Height gauge – depth gauge types – uses and specification – calibration and setting as per standard	Construction for geometrical drawings angles and triangles.	System of units – British – Metric S.I Units for Length – area – volume – capacity weight – time – force – temperature – their conversion
5.	Scrapping to rough and size	Measurement of angles – Vernier Bevel protractor – Graduation on universal Bevel protractor – Reading	Geometrical construction of Rectangle – Square –	Principle of corrosion – corrosive materials and non-corrosive materials – causes

		of universal Bevel Protractor	Triangle –Circle	and remedies.
6.	Internal Fitting, Drilling & Fitting	Specification Drill types – reamer types – various cutting angles – taps and dies –types –uses –tap drills and dies calculation- types of hammer.	Polygons and ellipse, parabola and hyperbola	Acceleration – speed- Equation of motion – Friction – Principles of friction – related problems
7.	Grinding m/c Practice types – method of drill bit and chisel grinding	Geometrical construction of involute, oval, and helix. Reviewing the various geometrical constructions.	Concept of scalar and vector quantity with examples. Newton's laws of motion. Law of conservation of momentum – mass – weight - density	
8.	Snap gauge filing	Gauges – types – Uses-Care & maintenance – tolerance –limits – fits –definitions & applications.	Free hand practice on printing style for standard letters and numbers	Square roots factorization method –division method.
9.	**TURNING:** Tool grinding- tool setting & job setting.	Lathe- types – construction –parts- functions – specification. Lathe accessories.	Free hand practice on printing style for standard letters and numbers.	Percentage – changing percentage to decimal vice versa- simple problems.
10.	Facing and chamfering, plain turning	Different types of operations – performed in lathe	Free hand sketching of St. lines. Square, Rectangles, Circles, Polygons and ellipse.	Heat treatment of metals – methods for Heat treatment
11.	Different types of shoulder and small radius turning	Cutting tools materials – types – selection-various cutting angles – uses and applications	Free hand sketching of simple geometrical solids cube, prism, cylinder sphere, pyramids.	Work –power –energy – simple problems.
12.	Taper turning and simple thread forming	Types of threads – application – tapping and dieing process – metrics and inch threads. Different process of paper turning & thread calculation	Free hand sketch of measuring tools, steel rule, inner caliper, outer caliper.	Different types of force- Stress – strains –modules of elasticity simple problems.

13.	Sheet Metal Work Marking and simple sheet metal joints	Sheet metal hand tools –marking tools – cutting-shaping tools –types and uses	Free hand sketch of measuring tools, Vernier Caliper, Micrometer	Ratio and proportion. Applications, Simple problems.
14.	Cylinder with brazed joint	Standard wire gauge – soft and hard soldering various allowances – used in sheet metal joint	Free hand sketch of Hand tools. Various types of Hammers Spanners, Allen Keys, Feeler Gauge.	Simple machines – principles of M.A – V.R. – of simple mechanism of simple machines.
15.	To make simple trays – riveted and solder joints.	Types of sheets & uses – folding – notching –wiring-hemming – allowances and uses.	Free hand sketch of Hand tools. Chisel, Various types of punches.	Algebra symbols use in algebra – co-efficient terms unlike terms – addition-subtraction- multiplication and division.
16.	**Welding:** Welding practice Straight line bead- square butt joint – single 'V' Butt joint	Welding types – Arc Welding –Gas Welding – Welding tools and equipments- Types of welding joints –Electrode and current selection – Specifications and safety precautions	Scales construction of plain scale. Representing faction	Algebra power & exponents – Laws of exponents.
17.	Welding practice: Using gas welding	Types of gases used in gas welding oxy acetylene flame setting Gas pressure and nozzle selection. Edge preparation for Arc & Gas welding process	Simple dimensioning technique size and location dimension for parts, holes, Angles Taper, Screw, etc. as per IS: 696	Algebraic simplification problems
18.	**Carpentry:** Simple planning, sawing and	Carpentry hand tools- Measuring tools – work holding devices – Bench vice. Work bench – Clamps types – sizes – uses- safety methods saws-Plan types – setting sharpening – uses etc.	Simple dimensioning technique size and location dimension for parts, holes, Angles	Algebraic simplification problems

	chiseling		Taper, Screw, etc, as per IS: 696	
19.	Simple mortise and Tenon joints practice	Different types of saws – Saw setting –Types of joints – Application – wood working machine – specification and their uses. Adhesives type and uses.	Dimensioning practice Unidirectional system and Aligned system	Equations: Simple simultaneous, quadratic
20.	**Electrical:** Demonstration and identification of cables. Soldering practice – Series –Parallel connection Measurement of electrical energy – Multi meter.	Atom & Atomic structure –electrons – Fundamental terms – work power – energy –units –voltage-current – resistance –colour codes. Types of cables – standard wire Gauge-Ohm's law-Kirchoff's law	Dimensioning practice: Unidirectional system and Aligned system	Application, construction and solution of problems.
21.	Demonstration & practice on fixing common electrical accessories. Testing of domestic appliances – Building layout assemble of small electrical circuits.	Series and parallel connection – Simple problems – properties of conductor, semi conductor and insulator. Primary and secondary cells common electrical accessories and their specification. Demonstration and description of domestic appliances.	Isometric view of simple solids; cubes and Regular solids.	Use of Logarithm and anti logarithm table. Logarithm and exponent.
22.	Construction of Calling Bell (Electromagnet) Testing. Rewinding of	Magnetism and electro magnetism – simple – Motors generators – principles and rules applied	Isometric view of simple solids, Cubes and Regular solids	Basic operations involving logarithm in the computation.

	electromagnet – identification, of DC generator. Use of Ohmmeter and Megger.			
23.	Demonstration and Reading of Electrical Measuring Instruments	Explanation of electrical measuring Instruments – Ammeter-Voltmeter-wattmeter-Energy meter	Isometric view of tapered blocks: Single sided and Double sided.	Problems related to the trade using logarithm tables
24 & 25.	**Electronics:** Testing of active & passive component with suitable meters like Ammeter, Voltmeter & Multimeter-Testing of DC & AC. Assembly and testing of simple electronic circuits (power supply) Testing of amplifier	Electronic Activities – Passive components –Resistors –Capacitors-inductors –coils-Transformers-Relays-Applications and Uses. All PN diodes Transistor IC's, simple and logic gates, Application and uses. Simple rectifiers, power supply, amplifier-logic gates – Principle of operations	Isometric view of stepped blocks: Single & Double sided and Center 'v' shape. Isometric view of complicated blocks – combined of simple, tapered and stepped blocks	Fundamental geometrical definition angles and properties of angles, triangles, properties of triangles. Pythagoras theorem, properties of similar triangles
26.	Class Test	Class Test	Class Test	Class Test

(SEMESTER – II) 1. GENERAL				
WEEK NO.	**PRACTICAL**	**THEORY**	**ENGINEERING DRAWING**	**WORKSHOP CALCULATION & SCIENCE**
One week (27)	Introduction and Familiarization with the Institute. Importance of trade training machinery equipment used in trade	(A) Orientation programme for recognizing different fibres, yarns and fabric and their properties	Isometric view of complicated blocks – combined of simple, tapered and stepped Blocks.	Equations: simple simultaneous, quadratic etc.
One week (28)	Demonstration of all types of Safety precautions to be taken in practice.	(B) Safety precautions related to the trade, machines, materials used in various processes such as under – (i) For steaming, hot air drying, exhaust arrangement, use of gases etc. (ii) Handling of corrosive chemicals and other materials concerned. (iii) Handling of electrical installation for machines in the trade (iv) Introduction and Familiarization and Handling of various machines used for Wet Processing. (v) Fire – hazards and Fire – Extinguisher.	Drawing of sectional & longitudinal shape of fibres	Basic problems related with logarithm .Use of logarithm and anti-logarithm table. Logarithm and exponent.

Two weeks (29-30)	Test of hardness of water, calculation for use of Water and steam in general.	(C) Studies on General utilities. Water – soft water and hard water, water softening, use of Water, Steam & gases. Cycling & recycling of water and water conservation.	Interconnection of isometric, oblique drawings of and vice-versa.	Fundamental methods used for transmitting motion and the calculation involved therein. Speed calculations, velocity ratio to the chemical processing related machine.
← 2. FIBRE STUDIES →				
Two weeks (31-32)	Identification of different fibres, physical & chemical methods in practice.	Classification of Textile Fibres, description & properties of fibres, cotton, jute, flax, silk, wool, nylon, polyester acrylic & viscose-rayons, Identification of textile fibres & their blends.	Interconnection of isometric, oblique drawings of and vice-versa.	Fundamental geometrical definition angles and properties of angles, triangles, properties of triangles. Pythagoras theorem, properties similar triangles.
← 3. PREPARATORY CHEMICAL PROCESSING →				
Eight Weeks (33 – 40)	Preparatory Chemical Processing Bleaching of yarn & grey cloth in practice. a) Desizing of cotton.	(a) Water used for Textile processing and its specification. (b) Inspection of grey fabric and repairing /mending, stitching and	Orthographic view of simple solids.	Rectangle, Square, Rhombus and Parallelogram and their properties. Circle and properties of circle and regular polygons.

	b) Scouring of cotton & wool, Degumming of silk c) Bleaching – using hypochlorite & peroxide for cotton. Peroxide bleaching methods for silk and wool. d) Use of optical whitening Agents. e) Washing & drying of different textiles and study of washing & drying machines.	marking, cropping. Study of shearing, singeing, desizing scouring and bleaching process for cotton and other textile fibres and their blended materials. (c) Degumming of silk, scouring of wool etc. (d) Study of various chemicals and auxiliaries involved in bleaching processes. Study of damages during bleaching, their methods of detection by physical methods and their prevention. Use of optical whitening agents. (e) Washing of Yarns/fabrics after desizing / scouring / bleaching using suitable washing machines. Drying of yarns and fabrics.	Orthographic views of stepped blocks.	Specific heats of solids & liquids. Quantity of heat. Heat loss, Heat gain with simple problems.
←		4. MECHANICAL AND CHEMICAL FINISHING		→
Eight Weeks (41 – 48)	i) Starching of fabric. ii) Chemical Softening of textile fabrics.	(a) Damping, Calendering, Drying and Stentering. Preshrinking of cotton. Calendaring & roller coating / grinding & inspection. (b) Ingredients used in softening & stiffening, their properties and application.	Orthographic views of stepped blocks.	Menstruation: Plain figures, triangles, square, rectangle, Parallelogram ,etc.

	iii) Wash – n – wear finishing. (Ant crease Finish) iv) Water repellant and water proofing finish. v) Fire retardant and Fireproof finishes. (vi) Bio-chemical/ Enzyme assisted softening.	(c) Biopolishing or Enzymatic softening. (d) Study of various functional finishing processes and machine used thereof: - i) Anti crease and anti shrink finishes, water proofing & water repellency, fire retardency and fire proofing finish. ii) Heat setting process for synthetic or polyester cotton blended fabric. iii) Finishing of silk and woollen fabric – (i) Decatizing, (ii) Weighting of silk, (iii) Tampering & breaking of silk, (iv) Scroopy finish of silk, (v) Carbonisation of wool, (vi) Milling, (vii) Shrink proofing of woollen fabric etc. (viii) Moth proofing etc. (e) Chemical processing & finishing of Linen fabric.	Orthographic views of tapered blocks, curved blocks etc. Ortho graphic views of complicated blocks (both of taper & curve)	Trapezium, regular polygons, circle & related geometrical figure. Solid figures: Prism, figure, Cylinder, Pyramid, cone Trigonometry: Trigonometrically ratios use of Trigonometrical table.
One Week (49)	REVISION	REVISION	REVISION	REVISION
← 5. IMPORTANCE & NECESSITY OF LUBRICATION →				

Two Weeks (50 – 51)	i) Lubrication of various parts and machine.	i) Lubrication of various parts of machinery, High density oil, Light oil, Heat resistant oil, and grease etc.		Area of triangle by trigonometry, Simple problems, etc.
	ii) Maintenance, general observation.	ii) Runtime maintenance of various processing machines used in bleaching and finishing sections.		
52	Test	Test		Test
	SEMESTER - II	**Total – 26 weeks** (Week No. – 27 to 52)		

PART – II (3rd and 4th SEMESTERS): SYLLABUS FOR RELATED TRADE THEORY AND PRACTICAL FOR TEXTILE WET PROCESSING TECHNICIAN COURSE

SEMESTER – III

UTILITIES, ENERGY CONSERVATION AND ENVIRONMENTAL AFFAIRS

				CALCULATION & SCIENCE
Four Weeks (53 – 56)	1. (a) Running of a model effluent treatment plant in a laboratory with chemical dosing and filtration and aerations.	1. (a) Awareness about environmental pollution in water/ effluent and air in industry and their control. Working principle of Effluent treatment plant and its running. Water & air pollution parameters and their permissible limits. Noise pollution & its control. Permissible limit of noise in different cases. Health hazards for water, air & noise pollution. Measures for prevention or reduction of level of water/air/noise pollution.	Ortho graphic views of complicated blocks (both of taper & curve)	Finding height and distance by trigonometry. Application of trigonometry to shop problems.
	(b) Calculations of energy consumption and its saving. (c) Calculation for steam requirement.	(b) Energy saving in Textile Chemical Processing.		
		(c) Awareness about eco-friendliness (eco-mark scheme) of textile products. Eco-parameters and their permissible limits for textiles. Ban of certain azo dyes.		

Two Weeks (57 – 58)	Demonstration of running of boilers. Calculation of water, heat, & steam consumption.	2. Boilers and its efficiency. Efficient use of steam. Efficient utilisation of water & water circulation system. Different heating system and drying system and their efficient uses.		Triangle of forces, parallelogram of forces.
DYEING OF DIFFERENT TEXTILES AND DYEING MACHINES				
Nineteen Weeks (59 – 77)	Dyeing practice in laboratory by beaker dyeing process for the following - (a) Dyeing with Direct, Basic Sulphur, vat, solubilised vat, azoic and reactive dyes on cotton, jute and viscose rayon. (b) Dyeing of Polyester, nylon and acrylics with suitable dyes and dyeing machines. (c) Dyeing of cotton fabric using jigger machine and padding mangle with vat, azoic, solubilised vat and reactive dyes and pigment colours etc. (d) Stripping at of dye, redyeing, correction of dyeing defects etc. (e) Familiarization with fabric and yarn dyeing machines.	3. (a) Classification of dyes, study of various dyes used for natural and man made fibres and their blends such as Direct, Basic, Sulphur vat, Solubilised vat, Azoics, Mordant & Mineral colours, Aniline Black and metal complex acid dyes, disperse dyes, pigment colours, reactive dyes. (b) Trouble shooting in dyeing. Dyeing defects and their causes and remedial measures. (c) Introduction to Dyeing machines for loose fibres yarns and their uses. Yarn hank dyeing and yarn package-dyeing machines.	Riveted joints. Various types of joints as per ISI standard. Sketches for simple pipe unions with simple pipe line drawings. Concept of preparation of assembly drawing and detailing. Simple assemblies and their details of trade related tools/jobs/ exercises with the dimensions from the given sample or models.	Ohm's law. Simple; calculation, electrical insulating materials. Mechanical properties of metals. Heat treatment of steals hardening, annealing, tempering, normalizing, casehardening, standard and measurement Importance of Statistics – Measures of location: Arithmetic mean, Median, Mode, Geometric mean and Harmonic mean.
78	Test	**Test**		Test
SEMESTER-III		**Total – 26 weeks (WEEK No. – 53 to 78)**		

SEMESTER – IV

4. COLOUR SCIENCE, TEST OF COLOUR FASTNESS & COLOUR MATCHING IN DYEING

WEEK NO.	PRACTICAL	THEORY	ENGINEERING DRAWING	WORKSHOP CALCULATION & SCIENCE
Ten Weeks (79 – 88)	(a) Dyeing of wool, silk, flax, jute with suitable dyes, using suitable machines. (b) Dyeing of different blended textiles. (c) Familiarization with fabric dyeing machines. (d) Testing of colour fastness properties to different agency. (e) Matching of shades (Both manual and by computer aided colour matching instrument)	(a) Study of tests for colour fastness for dyed textiles against washing, rubbing, hot ironing, UV-light or sunlight exposure and perspiration etc. (b) Details Study of fabric dyeing machines like jigger, Padding mangle, winch, continuous dyeing ranges, beam dyeing machine, jet dyeing machine etc. (c) Study of steaming, soaping and developing for dyeing and after treatment. (d) Manual colour matching and computer aided colour matching. Measurement of colour parameters.	Details and assembly of Vee-Blocks with clamps. Blue print reading. Simple exercises related to missing lines. Blue print reading. Simple exercises related to missing views. Blue print reading. Simple exercises related to missing symbols.	Transmission of power by belt pulleys and gear drive. Measures of Depression: Quartile deviation, Mean deviation, Standard deviation and Co-efficient of regression.

5. PRINTING, SCREEN MAKING & TROUBLE SHOOTING, ETC.

	Twelve Weeks (89 – 100)	(a) Printing of white/ coloured fabrics with different dyes/ colourant. Direct/Discharge and resist styles of printing by screen-printing method.	(a) Styles of printing. Study of various printing machines like roller printing, flat bed printing, rotary screen-printing machines. Concept of transfer printing machine		Important of strength of materials – Types of forces on Metals. Types stress and strain-Related problems. Principles of elasticity

		(b) Screen making for printing.	(b) Printing with direct azoic, vats, pigments and reactive dyes on cotton. Printing with acid dyes/pigment colours on Nylon and with disperse dyes/ pigment colours on Polyester fabric.		and relation between modulus of elasticity's.
		(c) Printing defects and Trouble shooting in Printing.	(c) Printing of blended textiles. Specialized printing – Raised printing, Rubber printing, Brasso printing, Bronze printing etc.		
		(d) Familiarization with Printing Machines.			
	Two Weeks (101 – 102)	Electronic maintenance of programmer & temperature controller in dyeing machines and Printing machines.	5. (a) Maintenance of pneumatic controls in Padding mangle	Blue print reading. Simple exercises related to missing dimensions.	Absolute Pressure Vacuum Pressure, Gauge Pressure, Relative Pressure-Static Pressure, Pressure Gauge.
			(b) Routine maintenance of various processing machines used in dyeing and printing sections.		
			(c) Fire-hazards extinguisher		
	103	Quality Concept	Quality Concept	Quality Concept	Quality Concept
	104	Final Test	Final Test	Final Test	Final Test

Social Studies :- The syllabus is already approved and common for all trades.

Note: -

i) The trainees should be taken around the textile mills, to show them the machining processes in the shop floor especially those, which are not possible in the training institutes, in different sections concerned. There should be at least four industrial visits for 1) Preparatory Chemical Processing, 2) Dyeing, 3) Printing 2) Finishing Sections.

ii) Necessary workshop calculation should also be taught along with concerned theory portion wherever it is found essential.

II. LIST OF TOOLS AND EQUIPMENTS FOR A BATCH OF 20 TRAINEES

TRADE: TEXTILE WET PROCESSING TECHNICIAN COURSE (BLEACHING, DYEING, PRINTING & FINISHING)

Sl.NO.	Name of the Tools and equipments with specifications, if any	Quantity
1.	Cement or Iron tanks for storing water (1200x1200x1200mm).	2 Nos.
2.	Thermometer ranging 0-110^{0}C and 0-300^{0}C	3 Nos. (each)
3.	Wooden vats 2100x750x600mm height	4 Nos.
4.	Electric water/heater (Giser) 45 litres	1 No.
5.	Water bath for 6 dye pots with electrical heating and temperature control	8 Nos.
6.	Stainless steel dye pots of 500 ml each (40 Pcs)	40 Nos.
7.	Yarn reeling arrangement (one big and one small)	2 Nos.
8.	Electronic Weighing balance with capacity 1 gm to 200gm and 5gm to 1kg.	4 Nos.
9.	Kit boxes with locks for keeping cloth /dyes etc.	16 Nos.
10.	Prepared Screens for Printing for single colour with rubber squeezee	8 Nos.
11.	Small Capacity Electrode boiler (lab model)	1 No.
12.	Buckets (enamelled and plastics) 6 each, 10 litres	8 Nos.
13.	Basins (enamelled and plastics) 4 in each lab	8 Nos.
14.	Wooden Almirah for dyes and chemicals	2 Nos.
15.	Scissors, Measuring Tape, Transparency Sheet	3 Nos.
16.	Inclined Table (1.5m length x 1.5 breadth 0.75 m depth) for screen and spray printing covered with PVC sheet and padded cloth	2 Nos.
17.	Instructor's table and chair	1 Set.
18.	Scientific Microscope (10 to 200 magnification)	2 Nos.
19.	Fibre staining solution and solvents for solubility tests for fibre identification	As Required
20.	Electric Oven/Air-circulating drying woven	1No.
21.	Lab model jigger machine	1 No.
22.	Lab model Padding Mangle with one chamber hot air drying machine	1 No.
23.	High temperature (i.e. 130^0 C) glycerin bath lab dyeing machine for polyester dyeing with the dye pots	6 Nos.

24. Crockmeter	1 No.
25. First Aid box	as required
26. Fire extinguisher, (Acid type or as required)	2Kg.
27. Glass rods 200mm long, with ends rounded, thick quality, (10mm dia.)	16 Nos.
28. Tables with glass top and 440-Watt tube light for exposure of Printing screen	1 No.
29. Twaddle – Hydrometers No. 1 to IV (full set)	2 Set.
30. Measuring cylinders capacity (1000, 500, 250, 100, 25, 10 ml)	8 Sets.
31. Monopan Lab-model Electronics balance having 200grm Capacity, With Accuracy of minimum: 0.1gm	4Nos.
32. Precision electronic weighing balance Accuracy minimum : 0.01gm	2 Nos.
33. Stainless steel vessels capacity (2 lits., 3 lits., 5 lits. With cover)	2 Nos.
34. Kerosene stoves (industrial types) – 4 in each lab. Or Gas cylinder and Gas Burners	4 Nos.
35. Stainless steel rods 12 mm thickness with wooden handle 300mm length	4 Nos
36. Bowls with rods for mixing dyes (Stainless steel) 500 ml	32 Nos.
37. Glass beakers capacity 100,250,400,500 ml. (Thick glass quality) Corning / Borosil	16 Nos. each
38. Steaming Chest (Cotteage type) Lab model 500 X 500 X 500 mm. or Lab model steamer	1 No.
39. Pressure cooker (domestic type) 5 &10 lit. Capacity with stainless steel container	2 Nos.
40. Measuring pipette (Graduated)	8 No. each capacity 10 ml, 25 ml, 50 ml
41. Measuring flasks with glass cork capacity 250ml, 500ml, 1000ml (for preparing standard solutions)	8 Nos.
42. Asbestos sheets 250x100mm or 200x200mm	32 Nos.
43. Wire gauges 150x150mm or 250x250mm	32 Nos.
44. Test tubes (thick class) 150mm (glass)	144 Nos.
45. Funnels 75mm dia. (glass)& 150mm dia. (glass)	32Nos.& 6 Nos.
46. Watch glasses (75mm dia.) & 150mm dia. (glass) for weighing dyes etc.	32 Nos.& 6Nos.
47. Plastic Spatulas (flat type) 150mm long	32 Nos.
48. Test tube holders	32Nos.
49. Pair of tongs (copper or stainless steels)	32 Nos.
50. Brushes for cleaning apparatus	32 Nos.
51. Plastic bottle with nozzles (spray bottles 500ml capacity)	16 Nos.
52. Reflectance Spectro-photometer & P – IV computer, printer and associated colour-matching software.	1 No.

53. MBTF – Light fastness tester	1No.
54. SASMIRA Lander-o-meter	1No.
55. Grey scale (staining & loss of depth), and Blue wool standard cloth	as required
56. Lab hank dyeing machine/Beaker dyeing open bath machine	1No.
57. Wooden A_4 size frame for print screen making.	1No.
58. Nails and Coarse cotton twine threads, cello tape	as required
59. Sona-coat (Gelatin) or Polyvinyl alcohol gel	as required
60. Binder and Ammonium diachrometer (sensatizer)	as required

For Laboratory Stores/Students Lab.:

1.	Plastic jars capacity 10-15 liters for storing chemicals	12 Nos
2.	Glass bottles with stopper 3 lit.	12 Nos.
3.	Glass jars with stopper 10-12 lits.	12 Nos.
4.	Glass siphones for transferring acids/alkalis etc.	3 Nos.
5.	Rubber gloves (big size not medical type)	3 Nos.
6.	Gum boots	3 Nos.
7.	Reagent bottles capacity 200ml. with stopper for 2N standard solution on each table	144 Nos.
8.	Small water baths (copper) dia 150 – 200 mm.	16 Nos.
9.	Sand baths (iron) dia. 150mm (for direct heating on burner/stove etc.)	16 Nos.
10.	Glass bottles (embered/dark coloured) 3 lits. (for storing chemicals which may be affected by light)	6 Nos.
11.	Pastle and mortars 150mm dia. Porcelain (for making powders 150 dia iron of solids)	8 Nos.
12.	Indicator bottles 50 ml capacity	8 Nos.
13.	Porcelain beakers 1 lit. capacity for preparing caustic soda solution	3 Nos.
14.	Goggles for safety precaution while handling corrosive chemicals	3 Nos.
15.	Burette 50 ml capacity	3 Nos.
16.	Conical flasks 250 ml	12 Nos.

LIST OF TEST BOOKS FOR REFERENCE:

Sl.No.	Name	Author	Published by
1.	Cloth Printing	R.S.Bhagwat (1968)	Uddham Prakasan, Dharam Peth. Nagpur - 10
2.	Screen Printing	P.K.Sahasrabuddhe(1972)	Jamnalal Bajaj Marg
3.	Bleaching, mercerizing and dyeing of Cotton material	R.S.Prayag	R.S.Prayag, Weavers Service Centre, 15 A Mama Parmanand Marg, Near Roxy Cinema. Mumbai – 400004.
4.	Textile fibres	Dr. V.A.Shenai	Sevak Publications B – 26 Royal Industrial Estate, Niigaun cross Road Wadala , Mumbai – 31.
5.	Occupational Health and / Safety in Textile Mills	Dr. V.A.Shenai	Sevak Publications B – 26 Royal Industrial Estate, Niigaun cross Road Wadala , Mumbai – 31.
6.	Chemistry of dyes and Principles of Dyeing	Dr. V.A.Shenai	Sevak Publications B – 26 Royal Industrial Estate, Niigaun cross Road Wadala , Mumbai – 31.
7.	Technology of Bleaching	Dr. V.A.Shenai	Sevak Publications B – 26 Royal Industrial Estate, Niigaun cross Road Wadala, Mumbai – 31.
8.	Technology of Printing	Dr. V.A.Shenai	Sevak Publications B – 26 Royal Industrial Estate, Niigaun cross Road Wadala, Mumbai – 31.
9.	Technology of Dyeing	Dr. V.A.Shenai	Sevak Publications B – 26 Royal Industrial Estate, Niigaun cross Road Wadala, Mumbai – 31.
10.	Textile Auxiliaries & Finishing	D.A. Vaidya	ATIRA, Ahmedabad
11.	An Introduction to Textile Printing	W. Clarke	Newnes – Butter worths London
12.	A Laboratory Course in Dyeings	C.H.Giles	The Society of Dyers & colourist P.B. 264 Brodford, Yorkshire B.D.I.2JB.