MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME

COURSE NAME : DI A IN TEXTILE MANUFACTURES

COURSE CODE : TX

DURATION OF COURSE : 6 SEMESTER **WITH EFFECT FROM 2012-13**

SEMESTER : FOURTH **DURATION : 16 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME								SW (17400)
							PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)	
				TH	TU	PR		Max	Min	Max	Min	Max	Min	Max	Min
1	Environmental Studies $	EST	17401	01	--	02	01	50#*	20	--	--	--	--	25@	10	
2	Yarn Manufacturing-III	YMA	17462	04	--	02	03	100	40	50#	20	--	--	25@	10	
3	Fabric Manufacturing-III	FMA	17463	03	--	02	03	100	40	50#	20	--	--	25@	10	
4	Knitting Technology	KTE	17464	03	--	02	03	100	40	50@	20	--	--	25@	10	**50**
5	Textile Testing-III	TTE	17465	03	--	02	03	100	40	--	--	--	--	25@	10	
6	Textile Chemistry-II	TCH	17466	03	--	02	03	100	40	--	--	--	--	25@	10	
7	Professional Practices-II	PPS	17054	--	--	03	--	--	--	--	--	--	--	50@	20	
8	Industrial Training	ITR	17055	--	--	**	--	--	--	--	--	--	--	--	--	
			TOTAL	**17**	**--**	**15**	**--**	**550**	**--**	**150**	**--**	**--**	**--**	**200**	**--**	**50**

Student Contact Hours Per Week: 32 Hrs.

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks: 950

@ Internal Assessment, # External Assessment, #* Online Examination, [ ] No Theory Examination, $ Common to All Conventional Diploma, ** Industrial training for six weeks to be completed during summer break after Fourth semester. Assessment to be done in Fifth Semester

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subject are to be converted out of 100 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : AE/CE/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/ ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/AU/FG

Semester : Fourth

Subject Title : Environmental Studies

Subject Code : 17401

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25@	75

#* Online Theory Examination

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

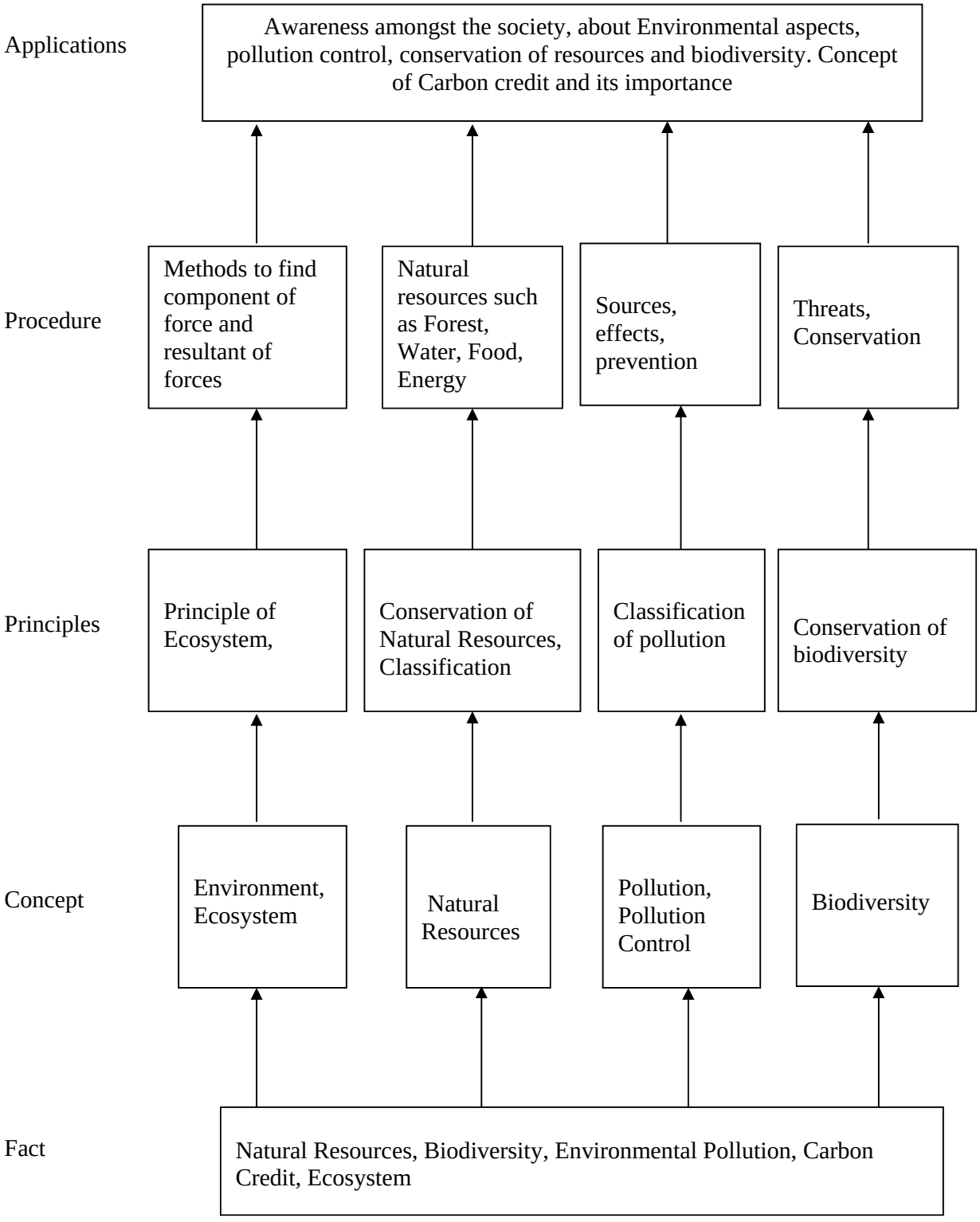
The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

General Objectives: The student will be able to**,**

1. Understand importance of environment
2. Know key issues about environment

3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic 1: Nature of Environmental Studies Specific Objectives: ➢ Define the terms related to Environmental Studies ➢ State importance of awareness about environment in general public **Contents:** • Definition, Scope and Importance of the environmental studies • Importance of the studies irrespective of course • Need for creating public awareness about environmental issues	01	04
Topic 2: Natural Resources and Associated Problems Specific Objectives: ➢ Define natural resources and identify problems associated with them ➢ Identify uses and their overexploitation ➢ Identify alternate resources and their importance for environment **Contents:** 2.1 Renewable and Non renewable resources • Definition • Associated problems 2.2 Forest Resources • General description of forest resources • Functions and benefits of forest resources • Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc. 2.3 Water Resources • Hydrosphere: Different sources of water • Use and overexploitation of surface and ground water • Effect of floods, draught, dams etc. on water resources and community 2.4 Mineral Resources: • Categories of mineral resources • Basics of mining activities • Mine safety • Effect of mining on environment 2.5 Food Resources: • Food for all • Effects of modern agriculture • World food problem	04	10
Topic 3. Ecosystems • Concept of Ecosystem • Structure and functions of ecosystem • Energy flow in ecosystem • Major ecosystems in the world	01	04
Topic 4. Biodiversity and Its Conservation • Definition of Biodiversity • Levels of biodiversity • Value of biodiversity • Threats to biodiversity	02	06

• Conservation of biodiversity		
Topic 5. Environmental Pollution • Definition • Air pollution: Definition, Classification, sources, effects, prevention • Water Pollution: Definition, Classification, sources, effects, prevention • Soil Pollution: Definition, sources, effects, prevention • Noise Pollution: Definition, sources, effects, prevention	03	08
Topic 6. Social Issues and Environment • Concept of development, sustainable development • Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits • Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate • Concept of Carbon Credits and its advantages	03	10
Topic 7. Environmental Protection Brief description of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights	02	08
Total	**16**	**50**

Practical:
Skills to be developed:

Intellectual Skills:

1. Collection of information, data
2. Analysis of data
3. Report writing

Motor Skills:

1. Presentation Skills
2. Use of multi media

List of Projects:

Note: Any one project of the following:

1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems of ponds, river, hill slopes etc

Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Yarn Manufacturing-III

Subject Code : 17462

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
04	--	02	03	100	50#	--	25@	175

NOTE:

- **Two tests of 25 mark each, to be conducted as per the schedule given by MSBTE.**
- **Total of test marks for all theory subjects are to be converted out of 50 and to be entered in mark-sheet under the head Sessional Work (SW).**

Rationale:

In the third semester, detailed study of the preparatory part of the spinning processes was covered. In Yarn Manufacturing-II carding & draw frames were discussed.

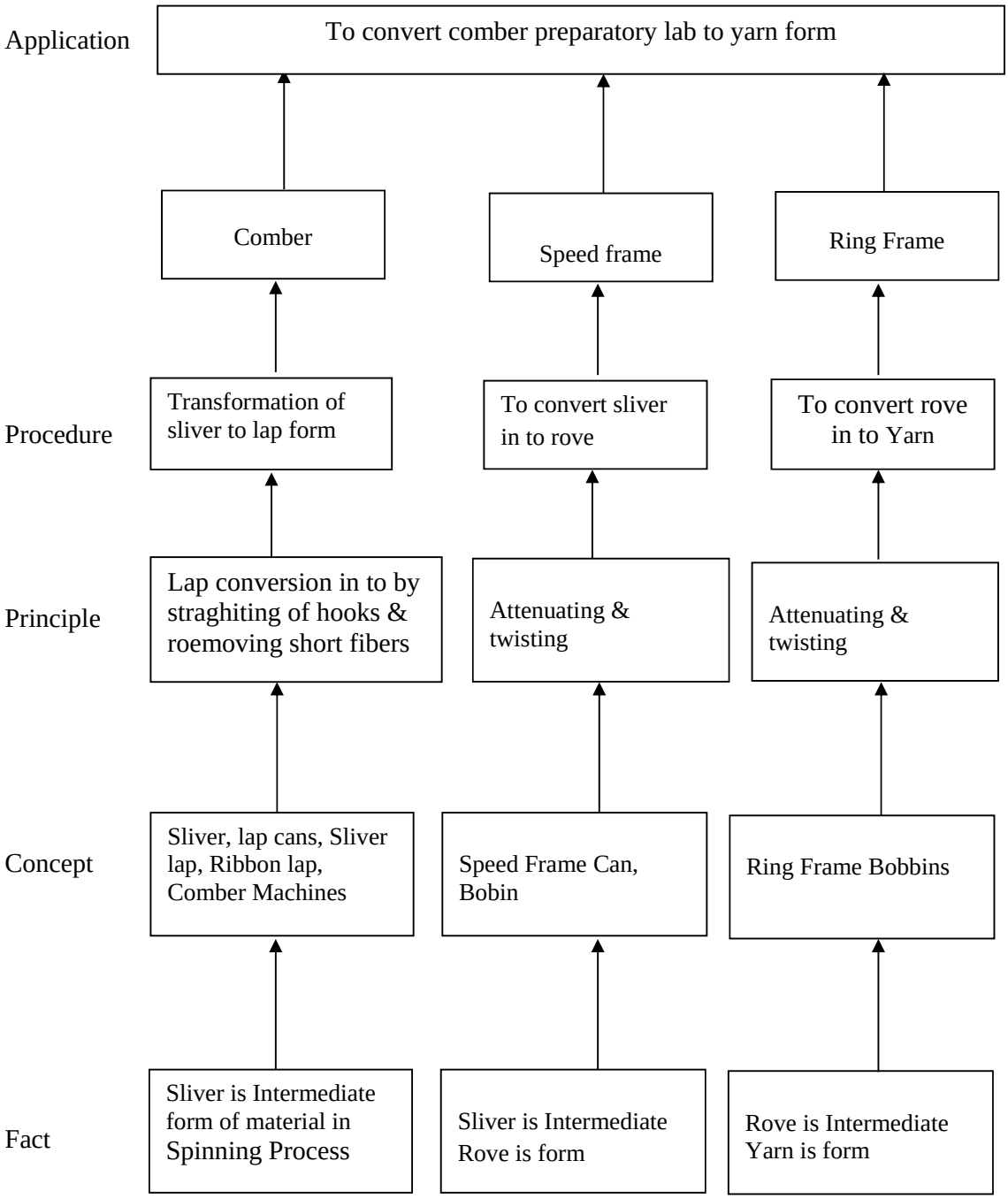
In this fourth semester, Yarn Manufacturing III - is a continuation of the detailed study of spinning process. This subject covers further part of spinning process comber preparatory and comber fly frame & ring frame. It covers the study of principles and description of these processes and functions of all machines and their parts with related information and skills.

Objective:

The student will able to:

a. Understand comber preparatory & comber fly frame & ring frame process.
b. Draw the sketch and gearing of all above machines.
c. Calculate draft, production of all above machines**.**

Learning Structure



Contents: Theory

Topic and Contents	Hours	Marks
Topic 1. Study of Comber lap preparation and Comber **Specific objective:** The student will able to ➢ Understand the concept of parallelization & blending of fibers ➢ Understand effect of setting & process parameters on material. ➢ Understand the importance of comber needles. ➢ Understand the defect in combing preparatory & combing process **Content:-** 1.1 Introduction – Preparation to combing and comber operation 1.2 Objects of Sliver lap, Ribbon Lap and Super Lap. 1.3 Study of construction and working of lap preparation machine-sliver lap, Ribbon lap and Super lap. 1.4 Influence of lap preparation on combing- evenness of lap sheet, deposition of the hooks. 1.5 Causes of defective production and their remedies at above machines 1.6 Calculation related to production & draft of Sliver lap & Ribbon Lap 1.7 Types of Comber - Sequence of operation of rectilinear comber 1.8 Technology of combing- parameters influencing the combing operation, influence of the combing on quality. 1.9 Influence of machine component and setting on combing.- Feed distance moved per cycle, type of feed ,the detachment setting, number of points on the comb, the depth of penetration of top comb, piecing. 1.10 The comb- cylinder comb, top comb, operations of comb 1.11 Drafting arrangement, waste removal 1.12 Study of important setting and its effects on working - step gauge, distance gauge, top comb settings. 1.13 Specification of Modern Comber 1.14 Causes and remedies of defective production at Comber 1.15 Calculation of Hank, Draft, Production ,and Noil Percentage	24	36
Topic 2. The study of Speed frame **Specific objective:** The student will able to ➢ Understand the concept of drafting & twisting of fibers ➢ Understand effect of setting & process parameters on material. ➢ Understand the importance of stop motions. ➢ Understand the defect in Speed frame. **Content:** 2.1 The necessity of Speed frame. 2.2 Description of functions of Speed frame – operating sequence, effect of arrangement of bobbins in two rows. 2.3 Operating regions of the roving- creel, Spindle and flyer - Imparting twist, the spindle, the flyer, the flyer top, the presser arm. 2.4 Winding of the bobbin. Flyer leading and bobbin leading its comparison 2.5 Gearing diagram of Speed frame (Question not to be asked in theory Exam) 2.6 Bobbin drive, cone drive transmission, lifter motion 2.7 Study of building mechanism of Speed frame- shifting of cone belt, reversal of bobbin rail, shortening of lift. 2.8 Monitoring device- sliver stop motion, roving stop motion 2.9 Gear change position of the Speed frame. 2.10 Modern developments in Speed frames – creel, drafting and collecting zones 2.11 Calculation of Hank, Draft, Twist & Production.	20	32

2.12 Causes of defects and remedies.		
Topic.3. Study of Ring frame process **Specific objectives:** The student will able to ➢ Understand the concept of drafting & twisting of fibers ➢ Understand effect of setting & process parameters on material. ➢ Understand the importance of balloon control rings. ➢ Understand the defect in ring frame. **Content:** 3.1 Introduction 3.2 Function and mode of operation. 3.3 Design feature of machine- Frame, creel, drafting arrangement, 3.4 Spindle drive, yarn guiding device, balloon control ring, separators, types of rings, 3.5 Traveller-task and function, Types, wire profile of Traveller, Traveller clearer, Traveller numbering system 3.7 Variable drive 3.8 Structure of Ring bobbin, Winding process, Builder motion of ring bobbin, building the base. 3..9 Monitoring system, ring data system 3.10 Modern development in Ring frame 3.11 Calculation of draft, twist and production of Ring frame, 3.12 Average count and 20^s conversion.	20	32
Total	**64**	**100**

Practical:
Skills to be developed:
Intellectual Skills:

1. Calculate the speeds of various machine parts in comber preparation, comber, Speed frame and ring frame.
2. Calculate the production of comber preparation, comber. Speed frame and ring frame.
3. Select various settings of comber, Speed frame and ring frame.
4. Identify various change places at comber preparatory, comber speed frame and ring frame.

Motor Skill:

1. Draw gearing diagram of, Comber preparatory and Comber machines speed frame and ring frame.
2. Draw the sketches of, Comber preparatory and Comber Machines speed frame and ring frame.
3. Measure the speed of Comber preparatory and Comber machine speed frame and ring frame components using tachometer.
4. Follow standard setting procedure for various Comber preparatory and Comber machine speed frame and ring frame components.

List of Practical

1. Study of gearing diagram and passage of the sliver lap machine, calculations of speed of various parts, draft and production.

2. Study of gearing diagram and passage of the Ribbon lap machine, calculations of speed of various parts, draft and production.
3. Study of gearing diagram and passage of the Comber machine, calculations of speed of various parts, draft and production.
4. Study of comber setting, (Step gauge, distance gauge, top comb setting, feed roll setting)
5. Study of gearing diagram and passage of the Speed frame machine, calculations of speed of various parts, draft and production.
6. Study of gearing diagram and passage of the Ring frame machine, calculations of speed of various parts, draft and production
7. Study of Drafting system, building mechanism and change places of ring frame.
8. Study of building mechanism, differential motions and drafting systems of a speed frame machine.
9. Ring rail leveling, thread guide setting & spindle gauging of a ring frame.

Learning Resources:

Sr. No.	Author	Titles	Publication
1	T. K. Pattabhiram	Essential Facts in Cotton Spinning.	Somaiya Publication Pvt. Ltd. Mumbai.
2	A. R. Garde (Editor)	Spinning Tablet Series (9 numbers)	The Textile association, India.
3	A. E. De Barr, H. Catling	The Principles and Theory Of Ring Spinning. Vol. 5	The Textile Institute Manchester.
4	Ed. By K. Ganesh, A. R. Garde	Cotton Spinning.	The Textile association, India.
5	R.Chattopadhyay, R. Rengasamy J	Spinning- Drawing, Combing and Roving.	NCUTE, IIT Delhi
6	K. R. Salhotra, R. Alagirusamy, R. Chattopadhyay	Ring Spinning, Doubling and Twisting	NCUTE, IIT Delhi
7	R. Chattopadhyay	Advances in Technology of Yarn Production.	NCUTE, IIT Delhi
8	W.klein	Practical Guide to combing & Drawing	The Textile Institute Manchester
9	W.S.Tagart	Cotton Spinning vol-2	Macmillian & Company ltd.
10	A. R.Khare	Cotton Spinning	The Textile Institute Manchester.
11	T. K. Pattabhiram	Elements of practical cotton spinning	Somaiya Publication Pvt. Ltd. Mumbai.

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Fabric Manufacturing-III

Subject Code : 17463

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

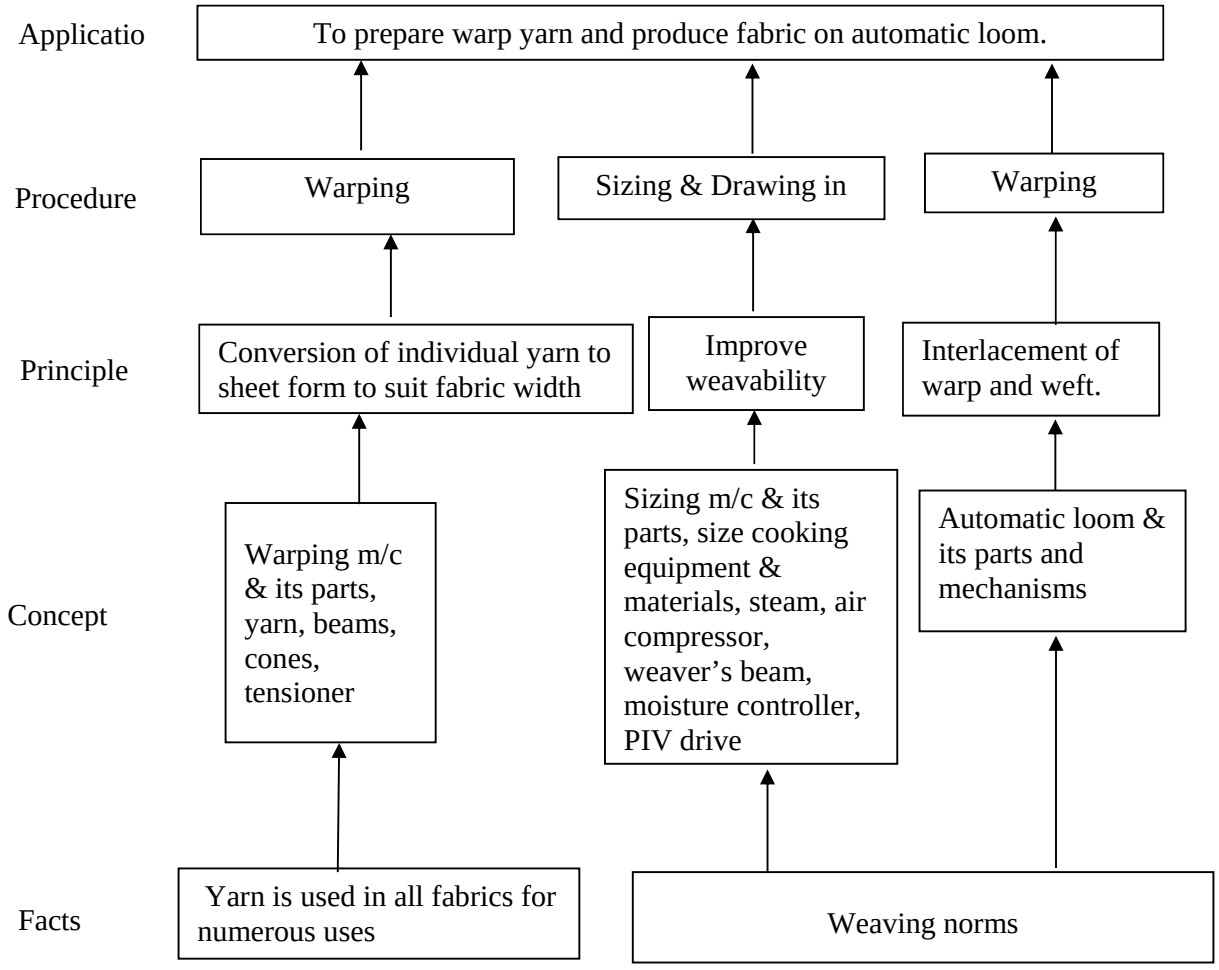
The textile manufacturing is done in various stages. In first year, we have experienced that this subject of fabric manufacture dealt with yarn preparation in winding and ordinary weaving on simple loom. In this second year, this subject deals with subsequent steps of yarn preparation and automatic weaving. These are essential stages in the fabric production. This subject intends to impart knowledge and skills in the area of important weaving process, i.e. warping, sizing operation and fabric production on automatic looms.

Objectives:

The student will be able to

1. Understand Sizing and automatic looms.
2. Identify the Sizing ingredients as per the yarn, fabric and sizing machine.
3. Calculate the Sizing & Auto loom production.
4. Understand the working of Automatic loom and it's preparation.

Learning Structure:



Detailed Content:

Chapter	Topic	Hours	Marks
1	**Sizing** 1.1 Objects of Sizing. 1.2 Kinds and functions of Sizing ingredients. 1.3 Cooking of size paste- number and quantity of sizing ingredients required sequence of addition of ingredients during cooking. Cooking of size paste with pressure cooker and storage. Size paste properties: congealing and keeping properties and their importance. Study of viscosity and concentration of size paste.	10	16
2	**Study of Sizing Machine**: 2.1 **Creel** construction, types, their merits and demerits, braking systems, tension control on warp. 2.2 **Size box:** All elements in size box, and their functions, size paste level control, temperature control, squeeze roller and weighting system, immersion roller. Wet splitting & its importance. 2.3 **Drying zone:** phenomena of multi-cylinder drying, removal of condensed water, Teflon coating, drive to cylinders, temperatures and its control. 2.4 **Splitting zone:** leasing, splitting, moisture control. Details of headstock, marking and measuring device, comb, sheeting rollers, drag roller. 2.5 **Winding zone:** drive to the weavers beam. 2.6 **Drive to sizing machine:** complete machine drive, use of PIV gears, differential cone drive, multi-motor drive, drives of different modern sizing machines, (Benniger, West Point etc.)	10	24
3	**Stretch and migration control:** 3.1 Definition and importance of stretch, measurement of stretch and its control at different zones (stretch meter), definition of lappers and migration, measurement of migration. 3.2 **Size pick up:** requirement of size pick up, size add-on, factors effecting size pickup. Testing of sized yarn Calculations of efficiency, size mixture, moisture in ingredients, water vaporising capacity, costing and dead loss, count of sized warp.	10	16
4	**Automatic Weaving** 4.1. Introduction, differences between ordinary loom and automatic loom. 4.2. Study of pirn changing mechanism, different types of weft feelers. 4.3. Warp stop motion of different types. 4.4. Various types of positive let off motions: Bartlett, Ruti, CIMMCO, etc. 4.5. Centre weft fork motion, its comparison with side weft fork motion. 4.6. Shuttle changing motion, its comparison with Pirn changing motion. 4.7. Study of colour retaining device on multiple box loom	14	36

	4.8. Study of centre selvedge. 4.9. Study of the warp preparation method for the Automatic looms.		
5	**Reaching In and Drawing In** 5.1 Different type of Reaching, Drawing-in, denting and knotting: Methods & machines. 5.2 Study of design of healds and types of healds. 5.3 Study of design of different reeds. 5.4 Calculation regarding count of heald sett and reed count. 5.5 Selection, care and storage of healds & reeds.	04	08
	Total	**48**	**100**

Practical:
Skills to be developed

Intellectual skill

1. Select sizing ingredients.
2. Identify the requirements of auto loom.

Motor Skills

1. Operate auto loom.
2. Prepare size paste.

List of Practical

1. Study of sizing machines (at least two visits to sizing units) and sketching the passage of warp on sizing machine and various mechanisms.
2. Dismantling, refitting, setting and timing of following mechanisms on Automatic shuttle looms.
    1. Shedding,
    2. Under-picking,
    3. Dagger-shaft, Swell mechanism
    4. Battery, Loose end cutter mechanism
    5. Weft fork and anti-crack,
    6. Let-off motion,
    7. Shuttle changing mechanism,
    8. Feeler mechanism,,,
    9. Warp stop motion,
    10. Operating the automatic loom to produce good cloth.

Reference:
Books:

Sr. No	Name of Author	Title	Publication
1.	Robinson and Marks	Principle of Weaving	The Textile Institute, 10 Black friars Street, Manchester M3 5DR
2.	Bennett	An introduction to automatic weaving	Indo Overseas Trading Co. 280 Carnac Road, Bombay and Columbine Press Co.Ltd., Manchester, London

3.	Banerjee N.N., Smt Banerjee	Weaving Mechanism, Vol I & Vol II	Smt.T.Bnerjee, Textile Book House, 29, Krishna Nath Road, Berhampore – 742 101, West Bengal India
4.	J.B. Aitken	Automatic Weaving.	Columbine Press (Publishers) Ltd., Old Clony House South king, Street, Manchester-2
5.	A. Ormerod,	Modern preparation and weaving machinery.	Butterworths & Co. (Publishers) Ltd., London, 88, Kingsway, W.C.2
6.	Talukdar M K	Weaving: Materials Methods and Machines	Mahajan Publishers Pvt Ltd Ahmedabad-9(1998)
7.	Wadekar	Sizing	Mahajan Publishers Pvt Ltd Ahmedabad-9(1998)

Specific Objectives:

Chapter	The Students will be able to
1	a) Identify sizing ingredients, Cooking of size paste. Number of sizing ingredients required. b) List characteristics features of sizing ingredients.
2	a) Draw the design of the sizing machine. b) List functions of various motions in sizing machine.
3	a) Measure stretch and its control at different zones using stretch meter b) Able to measure lappers and migration. size pick up, size add-on.
4	a) Identify working of different motions from Automatic loom. b) Develop the good quality of cloth.
5	a) Identify requirements of drawing-in and it's process for different fabrics. b) Develop the relation between design requirements and weaving requirements.

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Knitting Technology

Subject Code : 17464

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50@	--	25@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Knitting technology is the important area of textile industry. Knitted fabrics due to its stretchable and favourable properties are in good demand and it is expected to rise day by day. Knitted fabrics find uses for under garments, sports Uniforms, summer and winter dresses, etc. to a large extent. This sector is now diversifying into synthetics, domestic fabric, carpets, technical and geo textiles. Similarly, since last few years young generation has been attracted to readymade garments due to quality, cost and readiness of availability. As such, large opportunities for the textile technologist particularly diploma pass-outs exist in this field. Already many diploma pass outs are finding employment in this area. Therefore, the main object is to equip the students with all the relevant technical knowledge for manufacturing of knitted fabrics, articles, garments and the maintenance aspects of the machines used. This subject will help the students to start their small scale industrial units which will help them for self employment.

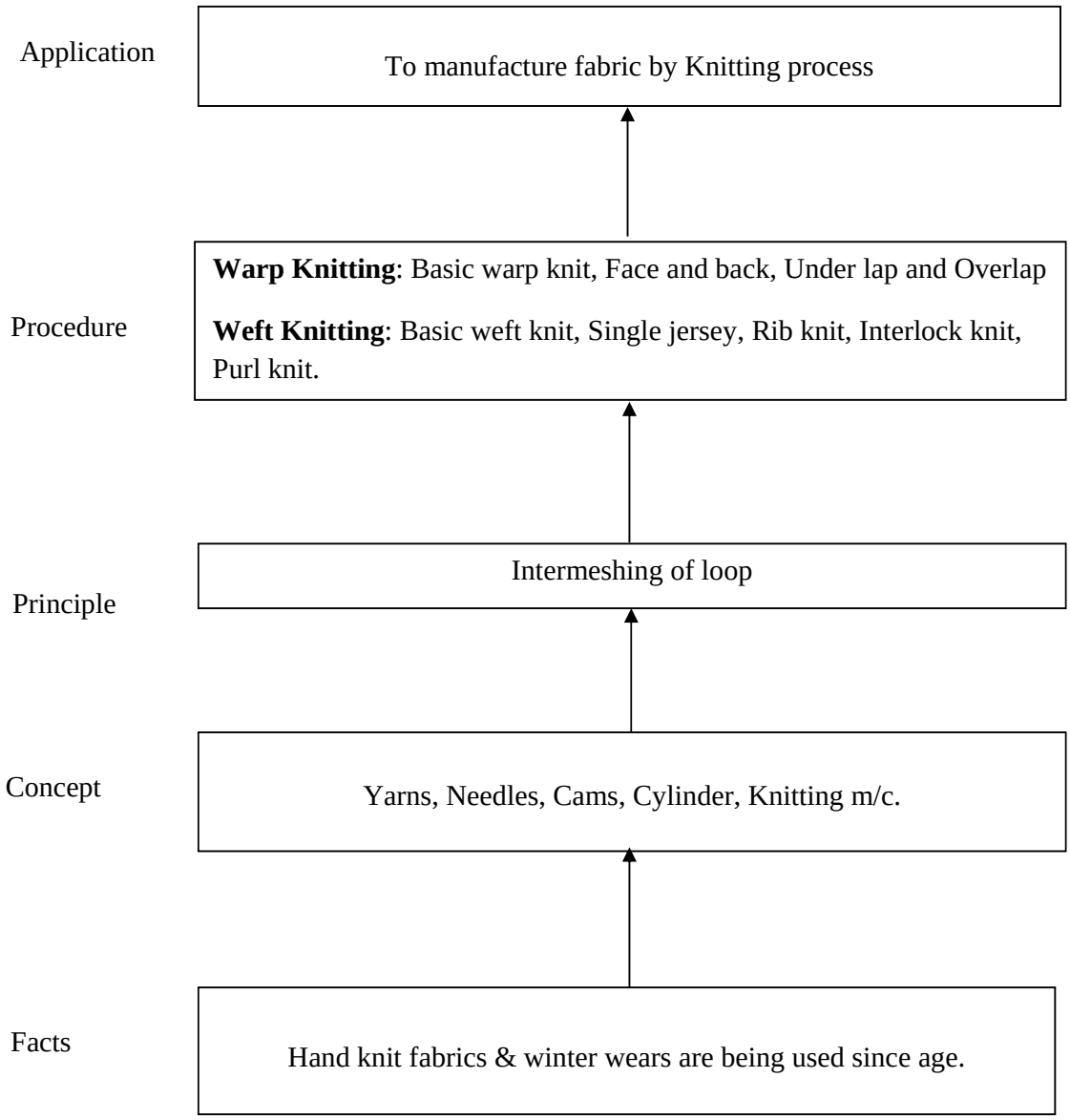
General Objectives:

The student will be able to**,**

Student will be able to

a. Understand Warp & Weft knitting machine.
b. Identify different Knitted structures.
c. Calculate Knitting machines production and efficiency.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic 1. Overview of Knitting Process **Specific objective:** The student will able to • To define knitting process • To interpret the difference between Woven & Knitted fabric. **Content:** 1.1) Introduction to knitting process. 1.2) Introduction of Warp & Weft Knitting. 1.3) Reasons for growth of knitting 1.4) Indian Knitting industry 1.5) Comparison of Woven and Knitted fabrics 1.6) Classification of Weft knitting machines.	02	06
Topic 2. Weft Knitting **Specific objective:** The student will able to • Define basic terminology of Knitting. • Identify different parts of Knitting and their function • Describe intermeshing process for Knitting **Content:** 2.1 Definition of Basic terms in weft knitting: closed loop, face loop, needle loop, sinker loop, course, wale 2.2 Function elements in Knitting - Types of needle & its comparison - Knitting action of different needles - Sinker & its function - Cylinder :Gauge, pitch - Cams - Feeder/stripper - Fabric spreader 2.3 Needles with different butt positions: Use in design 2.4 Positive feeder- its functions, types.	06	10
Topic.3. Weft knitting Machines **Specific objectives:** The student will be able to • Operate knitting machine. • Interpret different knitted fabric structure for appropriate use • Select the procedure of knitted fabric production. **Content:** 3.1 Passage of yarn through Single jersey machine 3.2 Single jersey machine -Structure, loop diagram, knitting elements, knitting action. 3.3 Rib knitting machine-Structure, loop diagram, Needle arrangement, knitting action, machine construction. 3.4 Interlock machine-loop diagram, structure, needle Arrangement, trick arrangement, knitting action. 3.5 Purl Machine-loop diagram, structure, knitting action 3.6 Characteristics of Single jersey, rib, interlock, purl fabrics.	08	16
Topic 4. Weft knitted fabrics **Specific objective:-**The student will able to • Represent the knitted fabric on paper. • Draw different knitted fabric structure.	06	12

• Differentiate the knitted fabrics **Content:** 4.1) Principle stitches in weft knitting-knit, tuck, miss. 4.2) Notations in weft knitting 4.3) Ornamentation of plain knit fabrics - La-coste, According, Thick Fleece, Jersey blister 4.4) Ornamentation of Rib Structure - Half cardigan, Full cardigan 4.5) Ornamentation of Interlock - Eight lock structure 4.6) Double knit structures-Milan Rib, Double pique, pique poplin, punto di roma, ottoman rib, texi pique		
Topic 5. Knitting Calculations **Specific objective:** The student will able to • Calculate knitting production in Kg/Day or Meters/day • Estimate yarn requirement for a particular production • Calculate no. of machine required for designed output **Content :** 5.1) Production Calculation 5.2) Grams per square meter calculation 5.3) Tightness factor 5.4) Stitch length calculation 5.5) Weight per linear meter calculation	06	12
Topic 6 : Warp knitting **Specific objective :** The student will able to • Describe the process of warp knitting • Compare different knitting technologies. **Content:-** 6.1) Introduction of warp knitting 6.2) Loop structure 6.3) Comparison of warp and weft knitting 6.4) Basic Warp knitting terms- overlap, underlap, open & closed lap 6.5) Application of warp knit fabrics 6.6) Classification of warp knitting	03	08

Topic 7 : Warp Knitting machine----------12 Marks **Specific objective:** The student will able to • Identify different parts of warp knitting machine. • Represent the warp knitted fabric on paper. • Understand mechanism of patterning. • Prepare the chain links. **Content:-** 7.1) Comparison of tricot And Rachel machine 7.2) Elements of Tricot knitting machine 7.3) Knitting cycles of Tricot m/c 7.4) Elements of Rachel knitting machine 7.5) Knitting action of Rachel machine 7.6) Notation for warp knit structures **Sub topic 7.1 :**Patterning in warp knitting---------- 8 Marks 7.1.1) Introduction of patterning. 7.1.2) Pattern wheel, pattern drum and chain links 7.1.3) Notation 7.1.4) Principle stitches in warp knitting	11	20
Topic 8 : Flat Bed knitting **Specific objective:** The student will able to • To differentiates flat knitting and circular knitting. • To understand mechanism of flat knitting. **Content:-** 8.1) Introduction of flat knitting 8.2) Types and classification 8.3) Knitting elements 8.4) Yarn path in flat knitting machine Knitting cycle.	03	08
Topic 9 :Quality aspects of knitting **Specific objective:-** The student will able to • Understand quality parameters of knitted fabric. • Define the knitted fabric defects. **Content:-** 9.1) Basic properties of yarns used for knitting 9.2) Defects and their remedies in knitted fabrics. 9.3) Quality tests for weft knitted fabrics.	03	08
TOTAL	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1) The functions of knitting mechanisms.
2) Different knitted fabric structures.
3) The designs of needles and cams.

Motor Skills:

1) Identify different knitted fabric structures.
2) Draw diagrams of needles and cams.

List of Practical's:

1. Study of Single jersey machine (Drawing, Understand the function of element).
2. Study of Double jersey machine (Drawing, Understand the function of elements).
3. Study of Flat knitting machine (Sketch yarn passage, Identify parts).
4. Study of various elements used on Circular knitting machine (Drawing, Identification of parts).
5. Study of principle stitches used on circular knitting machine (draw the loop diagram, assembling different cams).
6. Study of knitted fabric design, notation representation of fabric on paper(plotting design on paper, unroving the yarn, counting the C.P.I & W.P.I)
7. Analysis of Single jersey fabric(Identification, Unroving, counting of fabric cpi & wpi)
8. Analysis of R ib Fabric (Identification, Unroving, counting of fabric cpi & wpi)
9. Analysis of Interlock fabric (Identification, Unroving, counting of fabric cpi & wpi)
10. Study of Warp knitting machine (Drawing, Identification of various parts).
11. Study of gearing arrangement of circular knitting machine
12. Visit to modern Knitting unit (plot the process flow)

List of Assignments:

1. Draw diagrammatic notation & symbolic notation for different knitted structure**.**

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
1	David Spencer.	Knitting Technology:	Woodhead Publishing India Pvt. Ltd.
2	S. Raz.	Warp Knitting Production	Verlag meliand textile berichte, Heidelberg
3	A. Reisfeld.	Warp Knit Engineering	National Knitedoutwear association, Newyork
4	D. F. Paling.	Warp Knitting technology	Cloumbine Press, London
5	Dr.N.Anbumani	Knitting- fundamentals, machine, structure & Developments	New Age International(P) ltd.
6	Sadhan Chandra ray	Fundamentals and advances in knitting technology	Woodhead Publishing India Pvt. Ltd.

2. CDs, PPTs, Models, Charts etc. :

3. IS, BIS and International Codes:

1. Reference: ASTM D 3882-85 for fabric skewness.
2. Reference: AATCC 178-1994 for barre.

4. Websites:

1. http://www.shimaseiki.com/
2. http://www.kern-liebers.com/

3. http://www.groz-beckert.com/
4. http://www.knittingindustry.com

List of Instruments, Equipment and Machines:

1. Single jersey machine.
2. Double jersey machine.
3. Flat knitting machine.
4. Warp knitting machine.
5. Electronic weighing scale.
6. Pick glass.

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Textile Testing-III

Subject Code : 17465

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

There is variety of raw materials for textile manufacturing, such as cotton, silk, synthetic fibers, etc. These raw materials are being used individually or mixed in different proportions to form a yarn of desired quality. The raw materials can be tested for numerous characteristics like fiber length, fineness, strength, maturity etc. Intermediate products like sliver, roving etc. are also required to be tested for controlling the process, for optimizing the process parameters or for developing existing process. Finally, to ensure the quality product, final product that may be yarn, fabric or garment, testing is imperative. This subject intends to equip students with the concepts, principles and methods of testing of various textile fiber and yarns, and fabric which is helpful in selection of raw materials, process control, process optimization, quality assurance and research purpose.

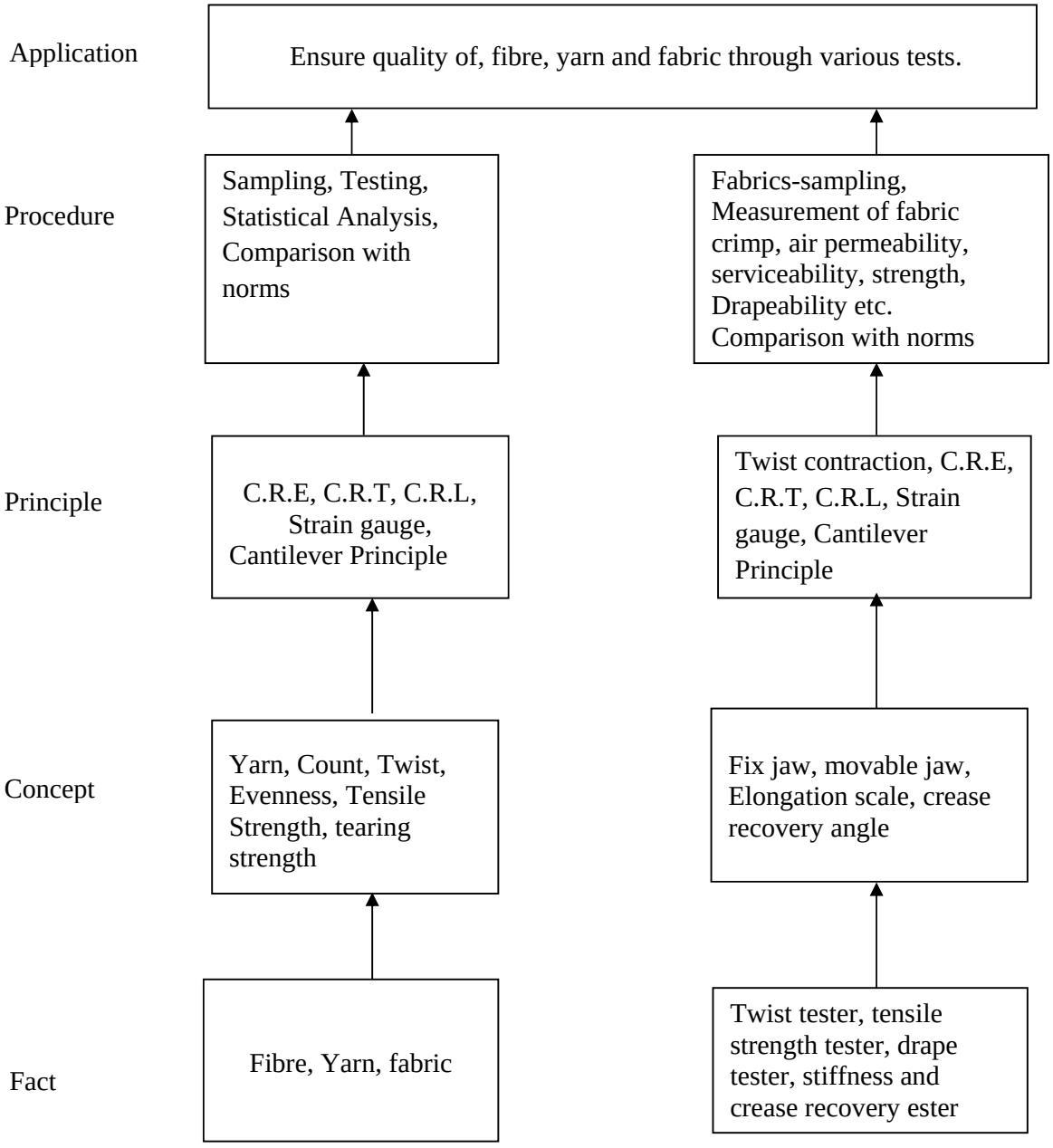
Since textile is system of mass production and contains lots of variations, lot of experimentation is required. Results obtained from specific number of observations are to be analyzed, interpreted and used for best outcomes. Therefore, students are equipped with the methods to analyze the testing results statistically.

General Objectives:

Student will be able to:

1. Understand principle & advanced concept of Testing of fibre/ Yarns / Fabric
2. Determine tensile, tearing & bursting strength of fabric.
3. List standard methods used for testing textile material.
4. Define various terms used in yarn & fabric testing.
5. Correlate the result of the tests to the application of material.

Learning Structure:



Detailed Contents:

Chapter	Contents	Hours	Marks
1	**Fabric Testing:** **Specific Objectives** ➢ Know different fabric properties to be tested. ➢ List importance of fabric testing. ➢ Interpretation of test results. ➢ Selection of Testing Methods as per End use. **1.1 Fabric sampling methods** **1.2 Fabric dimensional Properties**: Fabric Length, Width, Thickness, Weight measurement. Warp Count, Weft Count, and Threads/Unit length, Crimp in Warp and weft. Effect of crimp on fabric properties. Method of determination of crimp percentage (Crimp Tester). Cloth covers (IS 1963:1981 SP-15 Part-II 2000). Mathematical relation between Cover Factor, yarn count and diameter.	08	16
	1.3 Stiffness & Drape of fabric: • Terms and Definitions • Measurement of stiffness of fabric by tester based on cantilever principle (IS 6490-1971). • Determination of drape coefficient by drape meter (IS 8357-1977). **1.4 Crease Recovery**: • Measurement by crease recovery angle (IS 4687:1981 SP-15 Part-II 2000).	04	14
	1.5 Serviceability of fabric • Definition: serviceability, wear, and abrasion. • Measurement of Abrasion - Martindale Abrasion Tester (ASTM D 4966-1998). • Pilling of fabric: factors responsible for pilling of fabric. • Measurement of pilling : ICI pill box Tester (IS 10971:1984 SP 15 Part- II)	06	12
	1.6 Water and Air relation to fabric • Definitions : Waterproof, shower proof fabrics, water Repellent fabrics. Measurement: • Spray test, • Hydrostatic water head test. • Definition : Air-permeability, Air resistance, Air Porosity • Measurements of air permeability. • Factors affecting air-permeability.	08	14
2	**Tensile Testing** **Specific Objectives** ➢ Describe the process of tensile, tearing strength testing of fabric ➢ Use appropriate method of fabric strength testing. **Fabric strength**:	06	14

	• Tensile strength (IS 6359:1971 SP-15 Part – II 2000), • Tearing strength(IS 6359:1971 SP-15 Part – II 2000), , • Bursting strength (IS 1966:1975 SP-15 Part – II 2000),		
3	**Modern Testing Instruments** **Specific Objective** ➢ **Describe Modern Fibre and yarn testing Instruments** **3.1** Principle, working, parameters in brief. • High Volume Instruments (HVI) • AFIS testing. • Tenso-Jet • Tenso-Rapid yarn testing,	08	16
4	**Garment Testing** ➢ **Describe the testing methods for garments** **4.1Colour Fastness** : • Grey Scale for Colour Change and Staining • Test Procedure for fastness of colour & Staining Fastness to Washing, Dry-cleaning, & Light, Rubbing & Perspiration. **4.2 Dimensional Stability**: Expansion, Shrinkage, Swelling, **4.3 Seam**: strength, slippage.	08	14
	Total	**48**	**100**

Skills to be developed

1) Intellectual skills:

1. Proper selection of measuring instruments depending upon the data and precision required.
2. Analyze properties of matter & their use for the selection of material.
3. To interpret the results from observations and calculations.
4. To use these results for corrective actions in mechanical and wet processing.

2) Motor skills:-

1. Proper handling of instruments.
2. Measuring physical dimensions of fibre and yarn, fabric accurately.
3. To observe the phenomenon and to list the observations in proper tabular form.
4. To adopt proper procedure while performing the experiment.

List of Practical:

Determination of:

1. Determination of Cover factor.
2. Determination of Crimp % in warp & weft of the fabric.
3. Determination of Stiffness of fabric.
4. Determination of Drape of fabric.
5. Determination of Crease Recovery angle of fabric.
6. Determination of Tearing Strength of fabric.
7. Determination of Tensile strength of fabric.
8. Determination of dimensional stability of fabric
9. Determination of fibre parameters by HVI/AFIS

References:
Books:

Sr. No.	Author	Title	Publisher
1	Angappan	Textile Testing	SS Textile Inst, Coimbatore
2	J. E. Booth	Principles of Textile Testing	--
3	Kothari	Testing and Quality Management	IAFL, New Delhi
4	B. P. Saville	Physical Testing of Textiles	--
5	--	Methods of Tests, Fibre, Yarn & Fabric	CIRCOT, Mumbai

Websites:

1) www.scribd.com
2) www.fibre2fashion.com

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Textile Chemistry - II

Subject Code : 17466

Teaching & Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

The textile yarns and fabrics are being used in all occasions of life, which have varieties of patterns, colours and designs all over the world. The people use fabrics treated with either with natural and/or man made synthetic colours and chemicals to produce the desired effect in numerous hue and tone of different colours. The physical and chemical properties of these chemicals and colours are of prime interest to the people in textile industry. While working in various capacities in textile industry, it is very essential to acquire the necessary knowledge and skills in using these chemicals. In textile Chemistry-I Fiber manufacturing, sizing and pretreatments have been covered. In textile Chemistry II discussion will be about

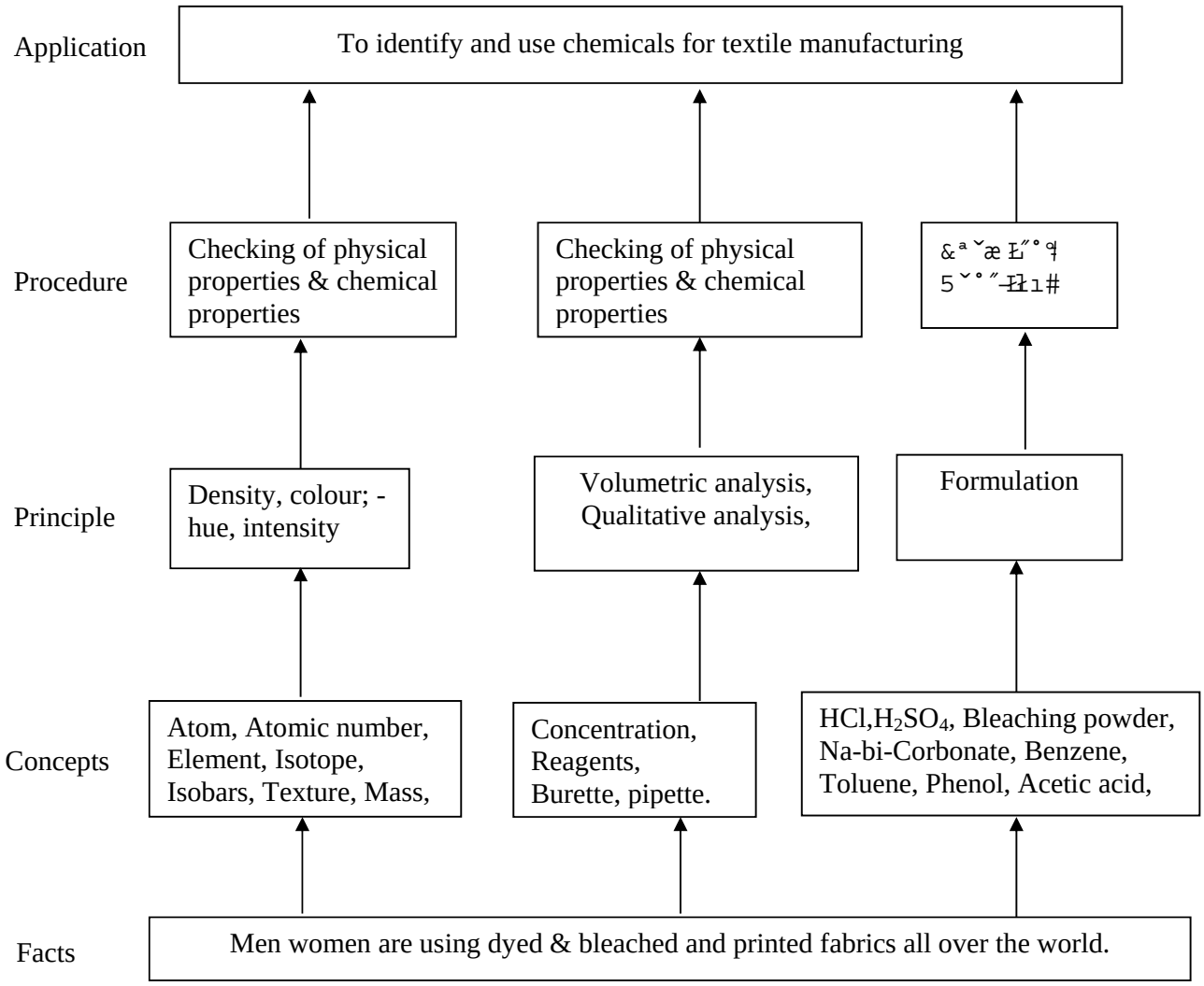
1. Dyeing of yarns and fabrics.
2. Printing of fabrics.
3. Finishing of fabrics like mercerizing, sanforising, etc.

Objectives:

The students will be able to

1. Study of various dyes and dyeing methods
2. Understand the dyeing machineries for cotton and polyesters
3. Select suitable ingredients for formulation of print paste used in printing cotton and other textiles
4. Classify the finishing processes

Learning Structure:



Detailed Content:

Chapter	Topic	Marks	Hours
1	**Dyeing** **Specific Objectives;** Student will be able to list the type of dyes used for various types of fibres Explain dyeing process for various textile fibres. 1.1 Dyeing of cellulose materials with Direct, Sulphur, Vat, Reactive and Azoic dyes. 1.2 Dyeing of Polyester with disperse dyes. 1.3 Dyeing of Nylon with disperse and reactive dyes. 1.4 Dyeing of acrylic with cationic dyes. 1.5 Study of dyeing of blends (Polyester and cotton or viscose)	28	14
2	**Dyeing Machinery** **Specific Objectives;** Student will be able to, Identify machinery used for dyeing of fibre, yarn and fabrics. Understand method for blend dyeing. 2.1. Construction and working of machinery used for dyeing yarn and fabric: Package Dyeing, Jigger Winch, Padding Mangle And Jet Dyeing Machine.	20	10
3	**Printing** **Specific Objectives;** Student will be able to , List the various chemicals used in printing Understand different styles of printing 3.1 Printing of cellulosic fabrics with dyes direct, reactive, vat, and pigment colours. 3.2 Study of direct, discharge and resist styles of printing. 3.3 Brief study of flat bed printing machine, Roller printing machine and Rotary printing machine	24	12
4	**Finishing** 4.1 Object and classification of Finishing processes. 4.2 Finishes applied on cellulose and synthetic fabrics: resin finishing, water proofing, flame retarding, soil release finish heat setting, optical brightening agent treatment. 4.3 Construction and working of Drying, Stenter, Calendaring, Mercerisation, Sanforising Machine	28	12
	Total	**100**	**48**

Practical:
Skills to be developed

Intellectual skills

a. To Dye of yarn and fabric

b. Match with the standard shed card

Motor Skills

a. Weigh accurately the dyes

b. Handle the glass apparatus carefully

List of Practical:

1. Dyeing of cellulosic fabric with different classes of dyes-5experiments.
2. Dyeing of synthetic fabric with different classes of dyes- 2experiments.
3. Testing of colour fastness (washing, light, and abrasion) for dyed fabrics and garments. 1experiments
4. Preparation of screen for printing – One experiment.
5. Preparation of printing paste of different dyes. 3 experiments.
6. Fixation of prints with steaming and curing methods.
7. Visit to process house.

References

Sr. No	Author	Title
1	Dr.V. A. Shenai	Textile Fibres
2	D. B. Ajgaonkar	Sizing
3	V. A. Shenai	Bleaching
4	V. A. Shenai	Dyeing
5	Printing	V. A. Shenai
6	An introduction of finishing	J. T. Marsh
7	Finishing	V. A. Shenai
8	Bleaching	E.R. Trotman

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Professional Practices-II

Subject Code : 17054

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Rationale:

Most of the diploma holders join industries for jobs. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Serial No.	Activities	Hours
1	**Industrial Visits** Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries : Spinning /Weaving / wet processing/ garment/Knitting	16
2	**Lectures by Professional / Industrial Expert Lectures to be organized from any two of the following areas:** 1) Interview Techniques. 2) Modern Ring frame 3) Applications of Sensors and Transducers in Textiles 4) Different methods of Yarn manufacturing other than ring spinning 5) Latest developments in weaving machines 6) Other related topics	08
3	**Information Search:** Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested : 1) Lubricants & additives 2) Humidification and air conditioning in textile mills 3) Illumination in textile mill 4) Technical features of Spinning preparatory and spinning machineries 5) Technical features of weaving preparatory and weaving machineries 6) Technical features of garment manufacturing machineries 7) Specialty textiles 8) Intelligent textiles 9) Different drives/Transmission systems in textile machines. 10) Types of bearings – applications and suppliers. 11) Solar equipment and lighting systems in textiles	12
4	**Seminar:** Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes)	12
	Total	**48**

Course Name : Diploma in Textile Manufactures

Course Code : TX

Semester : Fourth

Subject Title : Industrial Training

Subject Code : 17055

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
--	--	**	--	--	--	--	--	--

**** Industrial training for six weeks to be completed during summer break after Fourth semester.** Assessment to be done in Fifth Semester

Objectives:

- Experience the industrial environment for textile industrial processes, equipment & practices.
- Collect data about Plant lay out, equipment and machines-specifications and working available in different sections and collect data.
- Experience operation of machines and process parameters of spinning and weaving departments for the target production and collect data.
- Appreciate factory utilities – power water illumination men and material movement, pollution control, industrial safety etc.
- Carryout the material testing at different stages of yarn and fabric production for quality.
- Experience maintenance schedules of all the equipment and collect information on the effects of negligence of maintenance.
- Diagnose problems and find solutions to problems related with operation, and maintenance of equipment.
- Study the organization structure, job description, job specifications, promotional schemes, motivational strategies,etc.
- Collect data on production incentives, methods study and time & motion studies.
- Critical study of all activities with a view to find the areas for improvement.
- Devise solution to problem areas.
- Collect information / data for project work and seminars.

However, the detailed list of areas of study, working and data collection has been prepared and is enclosed in **3.5 – Specific area of study and working.** The student should regularly refer to this list and accordingly choose the areas and acquire the knowledge information and skills.

3.2 General Guidelines

- The students have to undergo industrial training in spinning and or weaving departments for 6 weeks in between fourth and fifth semesters.
- The student has to maintain a daily diary, in which they will record the daily achievements, which should be countersigned by the industry officer.
- The student should carry out the critical study of different activities and try to locate the problem or problems in any of the areas of product quality, productivity, efficiency, cost control and cost reduction, etc. Then, he should try to devise solutions to such problem.
- After completion of training each student has to bring the certificate for the entire duration for satisfactory completion of training.
- The student will be required to submit a report in handwritten, which will be properly bound.
- The students will be examined through viva-voce by the internal and external examiners. (The external examiner should be from industry).

3.3 Maintenance of Daily Diary

The students are required to maintain a daily diary, regularly in systematic manner. After the completion of day's work the important information is recorded clearly as per the instructions of section in charge and get it signed daily by him. Write in brief about observations made, daily work problems / project/s undertaken, discussion held, instructions given by section in charge, literature consulted, data etc.

3.4 Evaluation of daily diary

Term work assessment is based on daily diary maintenance, attendance, remarks of industry. Term-work Marks will be given on the basis of evidence of diary maintenance, adequacy and quality of record.

3.5 Specific areas of study and working: -

Students are required to collect the relevant information on the specific area given below. This information should be recorded in daily diary and further used in preparing the Final Report.

(a) General Information

Name of the Mill, Address and year of establish.
No. of spindles-warp, weft, Doubling and Total.
No. of loom-Non automatic, Automatic, Shuttle less, Total
Yarn counts spun, …… Warp. Weft.
Average count of the Spg. Dept…….
Shift wise No. of workers-Spinning, weaving processing, Engineering, General, Time office, Technical staff.
No. Of workers per 1000 spindles.
No. Of workers per 100 looms.
No. Of preparations in spinning.
Mill Building-type Roof plan.
No. Of sorts running.
Quantity of cotton consumed per month in kg.
Quantity of yarn produced in kg. Per month
Quantity of fabrics produced in sq. meters.
Quantity of fabrics exported in sq. meters.
Types of finishes given
Note on Quality Control, Research and Development.
Plan of various department, Showing general layout of the departments.
Welfare schemes for Workers And staff.

Safety measures provided.

(b) Spinning

i) Mixing & Blow-Room

1. Layout plan, lighting scheme and fire prevention method.
2. Handling and transportation of bales.
3. Temperature and Humidity.
4. Mixings (if possible) Type and Cotton used, Assessment of staple lengths, trash content.
5. Wastes (in details) with resale realization rate & disposal.
6. Speeds and settings of various beaters.
   i) Vertical ii) Horizontal iii) Modern openers, production of various machines, line diagram of the processing sequence for the mixing adopted in the mills.

1 Cleaning points for various mixings, Blows per inch, (Adopted for processing a particular mixing)
2 Productive and ancillary workers, shift wise.
3 Lap wt. Wrapping, wt/Yd tolerance limit, lap rejection percent.
4 Machinery maintenance programme-Charts.
5 Quality control programme charts, warping stds.
6 Operative hours and machine hours per 100 kg.
7 Other particulars, if any.
8 No of bales consumed and the weight of cotton used.

ii) Carding

1. Layout plan, lighting scheme and fire prevention methods.
2. Materials handling - Quality and mode.
3. Temperature and Humidity.
4. Speeds of various parts, like cylinder, licker in, doffer, flats doffer: mb, stripping rollers Grinders Rollers (fast and slow)
5. Hank of lap fed and hank of card sliver.
6. Draft constant and production constant of card.
7. Settings of card, size of the can.
8. Waste extracted (details) and Disposal of waste.
9. Frequency of stripping grinding flat grinding, Burnishing, re-clothing.
10. Shift wise productive and ancillary workers.
11. Production per hour Operative hours and machine hours per 100 kg.
12. Metallic card clothing and its information (if any)
13. Semi high production and high production card (note)
14. Maintenance schedule.
15. Quality control scheme-charts-wrapping stds,
16. Can size and special features fitted on a card.

iii) Draw Frame

1. Layout plan lighting scheme, fire prevention methods.
2. Temp, humidity and materials handing.
3. No of draw frames, No. of passages package size No. of deliveries for each mixings.
4. Drafting systems for a draw frame.
5. Sliver hank and Wt. Tolerance limits, can size.
6. Speed of F.R. of draw frame, Production / Delivery / hour.
7. Hank of sliver fed and sliver delivered.
8. Setting of different rollers.
9. Production-operative hours and machine hour per 100 kg.
10. Shift wise productive and ancillary labour.
11. Maintenance schedule.

12. Quality control scheme and chart, wrapping stds.
13. Special features (if any)

iv) Slubber, Inter, Roving Frames:

1. Layout plan, lighting, humidity and materials, handling.
2. No. of slubber, inter and roving frames and spindles each preparation.
3. Spindle speeds.
4. Twist multiple and T.P.I. used for each preparation,
5. Drafts, hank-fed and hank delivered,
6. Production in Hanks / spindle / 8 hours.
7. Drafting systems, can size, roving bobbin size.
8. No. of teeth on change wheels. (Like draft change wheel, twist wheel lay gear wheel etc.)
9. Top arm weighting arrangement systems.
10. Machinery maintenance schedule, roller, covering, scouring spindle roller setting and gauges used for different cottons, oiling schedule.
11. Shift wise number of productive and ancillary workers.
12. Production per 8 hours, operative hours of machine hours per 100 kg. of production.
13. Breakage rate, waste details, doffing time and No. of persons for doffing.
14. Quality control programme, control chart used wrapping stds.
15. Duties of various persons.
16. Threading methods used for Back and Front few bobbin.

v) Combers

1. Layout of combing dept.
2. No. of sliver lap Ribbon lap comber type and make.
3. Machine particulars and processing particulars, hank of sliver draft No. of doublings.
4. Production of sliver lap. Ribbon lap (lap size and lap weight and comber
5. Comber settings for different preparations.
6. Speed of sliver lap. Ribbon lap and combers (nips)
7. Waste percent foe different preparation.
8. Waste percent for different preparations.
9. Quantity of waste obtained and waste realization price and disposal of waste.
10. R.H. Temp. Lighting arrangement, material transport.
11. Note on high production comber (if any)
12. Quality Control programme- wrapping Standards.
13. Shift wise number of productive and ancillary workers.
14. Special feature, if any.

vi) Ring Frame Department

1. Layout of plan, lighting arrangement, humidification
2. No. of warp and weft ring frame with spindles / frame.
3. Spindle speeds, front roller speed, twist constant, draft constant, drafting arrangement
4. TPI Draft (back and front Zone) Twist factors used traveled.
5. Hank of sliver fed and counts spun.
6. Net weight / bobbin, per doff per operative, per hour
7. Production per frame per 8 hours operative hours and hours.
8. Yarn breakage rate, detail study of yarn breaks, Calculation of breaks / 100 spindle hours
9. Shift wise No. of productive and ancillary workers.
10. R.H. and temp
11. Quality control programme.
12. Machinery maintenance programme oiling, schedule, spindle gauge schedule spindle oil used.
13. Wrapping standards, yarn count, yarn strength, CSP and U% or C.V.% values for all counts.

Summary Of Spinning Section

Production in Hanks per frame and gms./spindle.

1) Spinning Organization (Hank & Draft)
Mixing ----------I----------II----------III----------
Machine Hank Draft
Mixing (Detailed Organisation)

Machine Sequence	Hank Count	Ends Doubled	Draft	Speed	Product spindles per 8 hrs hank/labs kg.
			TPI		

Similar information should be tabulated for other mixing and counts.

Labour Organisation

Deptt	I Shift	II Shift	III Shift	
	Productive Ancillary	Productive Ancillary	Productive Ancillary	Grand Total
Mixing & Blow Room to Ring Frame				
Total				
Maintenance Staff				
Department	I Shift	II Shift	III Shift	Total

Maintenance schedule – as followed in the Mill. (Department – wise date)

(c) WEAVING

i) Warp & weft winding

1. Layout plan, Lighting scheme, humidification and fire prevention installations.
2. Temp. and humidity maintained, materials handling.
3. Types of warp winding machines, their speed in meters per counts, worked, slub catcher settings, tensions, used, Eff. and H.P. required.
4. Spindles per operative (count-wise)
5. Production per operative (count-wise)
6. Breakage rate per 100 bobbins.
7. Yarn content of cones or cheeses in kg.
8. Tailing percentage (for B.C spooler)
9. Types of knots.
10. Quantity of waste obtained and waste realisation price and disposal of waste.
11. Operations to be performed by operatives.
12. Preparation for cheese dyeing (Note)
13. Preparation for weft re-winding.
14. Study of ribbon breaking, unwinding accelerator.
15. Maintenance schedule.
16. Quality control programme (if any)
17. Shift wise productive and ancillary labour.

ii) Warping

1. Layout lighting, humidification and fire prevention scheme.
2. Types of warping machines.
3. Types of creels their capacities and special features.
4. Speed and break application.
5. Beam dimensions and yarn content in metres or in kg.
6. Production per shift of 8 hrs. (Count wise)
7. Breakage rate per 400 ends per 1000 metres (Count wise).
8. Shift wise productive and ancillary labour.

iii) Sizing

1. Types of machines (2 Cylinder, Hot-air, multi cylinder)
2. Average sizing speed,
3. Drying capacity in kg / Hr.
4. Expected and actual production in kg.
5. Efficiency.
6. Special features and controls fitted on the sizing M/c.
7. Shift wise productive and ancillary layout.
8. Size recipes for different size-mix
9. Method of preparation of a size-mix
10. Cost of Size-mix material per kg.

iv) Drawing- In

1. Average No. of ends drawn/shift/operative for plain sorts, for drill sorts, for dobby sorts.
2. Particulars about drawing in and knotting machine. There production rate.
3. Labour complement shift wise (i) Productive (ii) Ancillary

v) Weaving Shed

1. Types of looms-width of the looms-Reed space available.
2. Jobber-wise allocation of looms.
3. Shift wise labour complement (i) Productive (ii) Ancillary
4. Duties of ancillary workers
5. Sort particulars.
6. Sort No
7. Name of the fabric
8. Finish given
9. Finished state Dimensions (i) width (ii) Length
10. Grey state Dimensions (i) width (ii) Length
11. Reed space in cms. Or inches.
12. Tape length in metres or yards.
13. Pick per cm. Or inch.
14. Reed count
15. Total selvedge ends.
16. Total ends.
17. Size % on warp weight
18. Count of warp yarn
19. Count of weft yarn
20. Count of selvedge yarn
21. Loom width in inches
22. Loom speed in R.P.M
23. Expected efficiency
24. Production in metres or yards / shift
25. Warp yarn required with waste allowance / per shift
26. Weft yarn required with waste allowance / per shift

27. Selvedge yarn required with waste allowance / per shift
28. Mixed counts working on looms.

vi) Automatic Weaving (if available)

1) Sorts worked and their particulars in the above manner
2) Organisation of auto-looms section.
   a) No of looms to a weaver with reference to width and type of auto loom.
   b) No of looms to jobber
   c) No of looms to Batter filler
   d) No of looms to smash hand
   e) No of looms to Oiler, helper, cleaner
   f) Breakage rate study on some sorts
   g) Wages paid to different categories of workers.
   h) Layout of looms and humidification and lighting and ventilation system.
   i) Quality control programme.
   j) Different type of wastes.
   k) Jobber and their work load duties.
3) Breakage rate study on all types of sorts possible.
4) Note on shuttle less loom (if existing)

Summary of Labour Organisation

Deptt	I Shift	II Shift	III Shift	
	Productive Ancillary	P.A.	P.A.	Total

vii) Grey Room

1. Inspection of Goods
2. Classification of Faults
3. Grey room Record
4. Stitching of Goods for preparing lots
5. Give particulars of goods in Grey Room
6. How are the stains removed?
7. What are the other corrective processes carried out in Grey room
8. No of workers in Grey room and there functions
9. How are the grey goods assessed for faults?
10. How is the ink prepared?
11. Lay out of grey room
12. No of Stitching machine
13. Manufacturers of Stitching machine
14. Particulars of Thread Used in stitching machine with reference to fibre composition count etc.
15. Design of Observation tables
16. No of Supervisors per Shift.

(d) Testing and Quality Control

1. Layout plan, lighting scheme, fire prevention methods.
2. Temperature, humidity, air-conditioning & its effects on fibre properties.
3. Sampling techniques used for testing fibres, yarn & fabric.
4. Fibre length, fineness, maturity & strength determination, equipment & methods.
5. Selection of mechanical process in Spinning depending upon fibre parameters.
6. Evenness testing of lap, sliver & roving and suggestions for corrective measures.
7. Yarn Count, Twist, Strength determination, equipment & methods.

8. Evenness & hairiness testing of yarn & suggestions for corrective measures.
9. Fabric testing & inspection.
10. Other testing such as trash content in cotton, nep count, waste percentage, cleaning efficiency etc.
11. Synchronisation of Quality Control with Maintenance activities.

(e) Costing

The following information can be gathered, **if possible**. If the management is reluctant to supply the information, do not insist upon.

1. Raw cotton cost for different types of wastes.
2. Waste realisation prices for different types of wastes.
3. Wages and fringe benefits given to the worker of various department.
4. Method of depreciation used for cost purpose.
5. Administrative charge percentage.
6. Selling expenses charges per kg or per Yd.
7. Spindle, Shift OH charges for different counts.
8. Selling price of yarn cost per kg. (if the yarn is sold to out side parties)
9. Waste multipliers for different mixings.
10. Loom shift OH charges for different mixings.
11. Method of costing.
12. Fabric cost sheet for some sorts.
13. Wages for the time rate workers in each department.
14. Wages for the piece rate workers in each department.

CRITICAL STUDY

Can you suggest ways to improve the operational deficiency and organisational technique, considering first each department you have studied separately and then collectively? Your suggestions may be based on (a) Material handling procedures, (b) Quality control programme (c) Maintenance schedules. (d) Production improvement techniques, (e) Quality improvement Technique.