

NEW STRUCTURE W.E.F. :- JULY 2016

**S.Y.B.TEXT. (TT) SEMESTER-I**

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
											TOTAL
3.1	TT/MMTT/TPE/TC	THERMAL AND AIR ENGINEERING	3	---	---	---	100	---	---	---	100
3.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-III	3	---	---	---	100	---	---	---	100
3.3	TT	TECHNOLOGY OF FIBRES OTHER THAN COTTON	3	---	---	---	100	---	---	---	100
3.4	TT	TEXTILE TESTING - I	4	---	---	3	100	50	---	50	200
3.5	TT	YARN FORMING TECHNOLOGY-III	4	---	---	2	100	25	---	---	125
3.6	TT	FABRIC FORMING TECHNOLOGY-III	4	---	---	2	100	25	---	---	125
3.7	TT/MMTT	TEXTILE DESIGN AND COLOUR	---	---	2	---	---	50	---	---	50
			21	---	2	7	600	150	---	50	800
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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NEW STRUCTURE W.E.F. :- JULY 2016

**S.Y.B.TEXT. (TT) SEMESTER-II**

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
											TOTAL
4.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-I	3	---	---	2	100	50	---	---	150
4.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-IV	3	---	---	---	100	---	---	---	100
4.3	TT	TEXTILE TESTING - II	3	---	---	2	100	25	---	50	175
4.4	TT/MMTT	CHEMICAL PROCESSING OF TEXTILES-I	3	---	---	2	100	25	---	---	125
4.5	TT	YARN FORMING TECHNOLOGY-IV	4	---	---	2	100	25	---	50	175
4.6	TT	FABRIC FORMING TECHNOLOGY-IV	4	---	---	2	100	25	---	50	175
			20	---	---	10	600	150	---	150	900
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
3.1	TT/MMTT/TPE/TC	THERMAL AND AIR ENGINEERING	3	---	---	---	100	---	---	---	100
3.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-III	3	---	---	---	100	---	---	---	100
3.3	MMTT/TC	POLYMER SCIENCE	3	---	---	---	100	---	---	---	100
3.4	MMTT	MANMADE FIBRE MANUFACTURE-I	4	---	---	3	100	50	---	50	200
3.5	MMTT	MANMADE STAPLE YARN MANUFACTURE-III	4	---	---	2	100	25	---	---	125
3.6	MMTT	MAN MADE FABRIC FORMING TECHNOLOGY -III	4	---	---	2	100	25	---	---	125
3.7	TT/MMTT	TEXTILE DESIGN AND COLOUR	---	---	2	---	---	50	---	---	50
			21	---	2	7	600	150	---	50	800
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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NEW STRUCTURE W.E.F. : JULY 2016

**S.Y.B.TEXT. (MMTT) SEMESTER-II**

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
											TOTAL
4.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-I	3	---	---	2	100	50	---	---	150
4.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-IV	3	---	---	---	100	---	---	---	100
4.3	MMTT	MANMADE FIBRE MANUFACTURE-II	3	---	---	2	100	25	---	50	175
4.4	TT/MMTT	CHEMICAL PROCESSING OF TEXTILES-I	3	---	---	2	100	25	---	---	125
4.5	MMTT	MANMADE STAPLE YARN MANUFACTURE-IV	4	---	---	2	100	25	---	50	175
4.6	MMTT	MAN MADE FABRIC FORMING TECHNOLOGY -IV	4	---	---	2	100	25	---	50	175
			20	---	---	10	600	150	---	150	900
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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NEW STRUCTURE W.E.F. : - JULY 2016

**S.Y.B.TEXT. (TPE) SEMESTER-I**

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
3.1	TT/MMTT/TPE/TC	THERMAL AND AIR ENGINEERING	3	---	---		100		---		100
3.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-III	3	---	---	---	100	---	---	---	100
3.3	TPE	MATERIAL ENGINEERING	3	---	---	---	100	---	---	---	100
3.4	TPE	MANUFACTURING PROCESSES-II	4	---	---	3	100	50	---	50	200
3.5	TPE	YARN MANUFACTURING MACHINERY-III	4	---	---	2	100	25	---	---	125
3.6	TPE	FABRIC MANUFACTURING MACHINERY-III	4	---	---	2	100	25	---	---	125
3.7	TPE	TEXTILE MACHINE DRAWING	---	---	2	---	---	50	---	---	50
			21	---	2	7	600	150	---	50	800
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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**S.Y.B.TEXT. (TPE) SEMESTER-II**

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
											TOTAL
4.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-I	3	---	---	2	100	50	---	---	150
4.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-IV	3	---	---	---	100	---	---	---	100
4.3	TPE	ELECTRICAL TECHNOLOGY	3	---	---	2	100	25	---	25	150
4.4	TPE	PHYSICAL TESTING OF TEXTILE- I	3	---	---	2	100	50	---	---	150
4.5	TPE	YARN MANUFACTURING MACHINERY-IV	4	---	---	2	100	25	---	50	175
4.6	TPE	FABRIC MANUFACTURING MACHINERY-IV	4	---	---	2	100	25	---	50	175
			20	---		10	600	175	---	125	900
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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NEW STRUCTURE W.E.F. :- JULY 2016

**S.Y.B.TEXT. (TC) SEMESTER-I**

R. No	COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB. TOTAL
3.1	TT/MMTT/TPE/TC	THERMAL AND AIR ENGINEERING	3	---	---	---	100	---	---	---	100
3.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-III	3	---	---	---	100	---	---	---	100
3.3	MMTT/TC	POLYMER SCIENCE	3	---	---	---	100	---	---	---	100
3.4	TC	CHEMISTRY OF TEXTILE FIBRES-II	4	---	---	3	100	25	---	50	175
3.5	TC	SPINNING TECHNOLOGY	4	---	---	2	100	50	---	---	150
3.6	TC	TECHNOLOGY OF PRETREATMENTS- I	3	---	---	3	100	25	---	50	175
3.7	TC	PRINTED TEXTILE DESIGN AND COLOUR	---	---	2	---	---	50	---	---	50
			20	---	2	8	600	150	---	100	850

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NEW STRUCTURE W.E.F. :- JULY 2016

**S.Y.B.TEXT. (TC) SEMESTER-II**

R. No	COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
			TOTAL								
4.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-I	3	---	---	2	100	50	---	---	150
4.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-IV	3	---	---	---	100	---	---	---	100
4.3	TC	CHEMISTRY OF TEXTILE FIBRES-III	3	---	---	---	100	---	---	---	100
4.4	TC	CHEMISTRY OF DYES AND PIGMENTS	4	---	---	3	100	25	---	50	175
4.5	TC	WEAVING AND KNITTING TECHNOLOGY	4	---	---	2	100	25	---	50	175
4.6	TC	TECHNOLOGY OF PRETREATMENTS- II	3	---	---	3	100	50	---	---	150
			20	---	---	10	600	150	---	100	850

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**S.Y.B.TEXT. (FT) SEMESTER-I**

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
											TOTAL
3.1	FT	BASICS OF ELECTRONICS	3	---	---	2	100	25	---	50	175
3.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-III	3	---	---	---	100	---	---	---	100
3.3	FT	FABRIC STRUCTURE AND DESIGN	4	---	---	2	100	25	---	---	125
3.4	FT	TESTING OF FIBRES AND YARNS	3	---	---	2	100	50	---	---	150
3.5	FT	TEXTILE MANUFACTURE	4	---	---	2	100	25	---	---	125
3.6	FT	PATTERN ENGINEERING-I	3	---	---	2	100	25	---	50	175
			20	---	---	10	600	150	---	100	850
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB.
			TOTAL								
4.1	FT	YARNS AND FABRICS FOR FASHION APPLICATIONS	4	---	---	2	100	---	---	50	150
4.2	TT/MMTT/TPE/TC/FT	TEXTILE MATHEMATICS-IV	3	---	---	---	100	---	---	---	100
4.3	FT	CHEMICAL PROCESSING OF TEXTILES	3	---	---	2	100	25	---	---	125
4.4	FT	PATTERN ENGINEERING-II	3	---	---	2	100	25	---	50	175
4.5	FT	TESTING OF TEXTILES AND APPARELS	3	---	---	2	100	25	---	---	125
4.6	FT	FASHION ILLUSTRATION	2	---	---	2	100	25	---	---	125
4.7	FT	TEXTILE DESIGN AND COLOUR	---	---	2	---	---	50	---	---	50
			18	---	2	10	600	150	---	100	850
	TT/MMTT/TPE/TC/FT	ENVIRONMENTAL STUDIES	2				Theory	Project			TOTAL
							70	30			100

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**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.1 THERMAL AND AIR ENGINEERING (TT/MMTT/TPE/TC)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

**Course Objectives:**

1. To understand basics of Thermodynamics, Thermodynamic processes and Air standard cycles. To get familiar with the procedure for solving numerical based on the same.
2. To understand the properties of steam, its types and applications in textile. Different types of steam boilers, its construction, accessories and mountings. To get familiar with the procedure for finding efficiency of boiler.
3. To understand basics of Refrigeration, Air Conditioning and thermic fluid heating system, concerned parameters, psychometric processes, application of the same in textile industry.
4. To get acquainted with various types of compressors, pumps and pneumatic symbols, application of the same in textile industry.

**1. Introduction to Thermodynamics:**

Laws of Thermodynamics – Zeroth Law, First Law, Second law of Thermodynamics. Thermodynamic Processes – constant volume, constant pressure, constant temperature, adiabatic, polytropic & throttling process with P-V & T-S diagrams, numericals based on the same.

**2. Air Standard Cycle:**

Introduction, Assumptions in thermodynamic cycles, Important terms used in thermodynamic cycles, efficiency of a cycle, representation of Carnot cycle, Otto cycle, Diesel cycle, on P-V and T-S diagram and numerical based on the same.

**3. Properties of Steam:**

Formation of steam at constant pressure, Temperature vs. Total heat graph during steam formation, Enthalpy, Enthalpy of water, Enthalpy of evaporation, Enthalpy of dry saturated steam, Wet steam, Superheated steam, Specific

volume of steam, Steam table, External work done during evaporation, Internal energy of steam, difference between Gas & Vapour, Types of Calorimeter, numericals based on the same. Applications of steam in textiles.

**4. Steam Boilers:**

Introduction, Classification of boilers, Important terms for steam boilers, Essentials of good steam boiler, Selection of a steam boiler, Study & construction of fire tube boilers such as Cochran boiler, Locomotive boiler, Study & construction of water tube boiler such as Babcock & Wilcox boiler, equivalent evaporation, efficiency of boiler & numericals based on the same.

**5. Study of boiler mountings & accessories:**

Safety valve – Dead weight safety valve, Lever safety valve, Spring loaded safety valve, high steam low water safety valve, Water level indicator, Fusible plug, Steam pressure gauge, Feed check valve, Stop valve, Blow off cock, Accessories – Feed water pump, Injector, Economizer, Superheater.

**6. Thermic Fluid Heating System:**

Introduction, thermic heating system, expansion & deaeration tank, their selection, Requirements of Fluids, deterioration of fluid, consequences, cleaning of the system, application in textile industry.

**7. Refrigeration:**

Unit of refrigeration, coefficient of performance (COP), difference between heat engine, refrigerator & heat pump. Air refrigerator working on reversed Carnot cycle with P-V & T-S diagram, derivation for expression of COP.

**8. Air Conditioning:**

Introduction, psychrometric terms, Dalton's law of partial pressure, psychrometric chart, psychrometric processes - sensible heating & cooling, bypass factor of heating & cooling coil, Humidification & dehumidification, sensible heat factor, cooling with dehumidification, cooling with adiabatic humidification of air, adiabatic chemical dehumidification, humidification by steam injection, mixing of air streams, objectives, methods & features of

modern humidification plant in textile mills, effect of moisture on textile fibres, sling psychrometer, humidistat.

**9. Compressor:**

Classification, Reciprocating, Rotary - vane compressor, Screw compressor, Centrifugal compressor, axial flow compressor. Pumps – Reciprocating, Centrifugal (construction and working principle).

**10. Introduction to Pneumatics:**

- (a) Pneumatic Circuits – Symbols of cylinder, control valves, check valves.
- (b) Air treatment – Symbols for Air filter, Refrigerated dryer, Lubricators.
- (c) Control valves – Symbols for Poppet valve, Pilot operated check valve and spool valve.
- (d) Application of Pneumatic circuits in Textile machines.

**Reference Books:-**

1. A Textbook of Engineering Thermodynamics by R.K. Rajput.
2. Thermal Engineering by R.S.Khurmi & Gupta.
3. Elements of Heat Engines (Vol. I & II) by Patel, Karamchandani.
4. A course in Refrigeration & Air conditioning by Arora & Domkundwar.
5. Refrigeration & Air conditioning by R. K. Rajput.
6. Pneumatic Systems by Majumdar.
7. Hydraulics & Pneumatics by Andrew & Parr.
8. Humidification & Air conditioning by S. P. Patel.
9. Textile Humidification by K. G. Vaze.
10. Journal of Textile Association NOV - DEC 2000 PP 167-170

**Course Outcomes:**

1. To explain basics of Thermodynamics, Thermodynamic processes and Air standard cycles by drawing concerned diagrams, derive the necessary expressions and solve numericals based on the same.
2. To explain the properties of steam, its types and applications in textile. To describe construction and working of different types of steam boilers, its accessories and mountings with the help of diagrams. To solve the numericals based on performance of boiler.

3. To explain basics of Refrigeration, Air conditioning and Thermic fluid heating system and its application in textile industry. To read and interpret psychometric chart. To describe psychometric processes with the help of diagrams and derive necessary expressions for the same.
4. To describe construction and working of various types of compressors, pumps and their applications in textile industry. To draw symbols for pneumatic systems.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.2 TEXTILE MATHEMATICS-III (TT/MMTT/TPE/TC/FT)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

**Course Objectives:**

1. To explain ordinary differential equation and solve problems. To apply ordinary differential equations for solving simple mechanical and electrical problems.
2. To explain linear differential equation and solve problems. To apply linear differential equations for solving simple mechanical and electrical problems.
3. To explain theory of large sample tests (Z-tests) with application in textiles. To explain theory of small sample tests ( $X^2$ , t and F-tests) with application in textiles.
4. To explain theory of estimation and theory of statistical quality control for process control and for lot control.

**1) Differential equations of first order & first degree:**

Method of solving Exact, Non exact, Linear and Non-linear differential equations.

Numerical solution of o.d. equations by Euler,s method and Runge Kutta method of fourth order.

**2) Applications of ordinary differential equations:**

Applications for solving simple electrical circuit problems and mechanical problems

**3) Linear differential equations of  $n^{\text{th}}$  order with constant coefficients:-**

Methods of finding Solution of L.D. equations in the form  $y = C.F. + P.I$   
Cauchy,s homogeneous linear differential equations with constant coefficients and there solution.

**4) Applications L. D. equations of  $n^{\text{th}}$  order with constant coefficients:**

Applications for solving simple electrical circuit problems and mechanical problems

**5) Testing of hypothesis and Large Sample Tests:-**

Introduction, Hypothesis, Statistic, Critical Region, Errors in testing, Level of Significance. Test for population mean, equality of population means population proportion & equality of population proportions.

**6) Small sample tests:-**

Test for population mean, equality of population means, population variance, equality of population variance. Test for goodness of fit and independence of attributes. Test for significance of population correlation coefficient.

**7) Estimation:-**

Point Estimation, types, unbiased estimators of population mean and variance. Interval Estimation, Confidence Interval for population mean based on normal and 't' and  $X^2$  distributions,

**8) Statistical quality Control:-**

Process Control: Control charts, X-chart, R-chart, C-chart, np-chart, P-chart.  
Lot Control: AQL, LTPD, AOQ, AOQL, O.C. Curve, Single and Double sampling plans.

**Reference Books:-**

1. A Text Book of Applied Mathematics: by J.N. & P.N. Watarikar.
2. Higher Engineering Mathematics by B. S. Grewal.
3. A Text Book on Engineering Mathematics by Bali, Saxena & Iyengar.
4. Mathematical Statistics by J.Fruend.
5. Applied Statistics & Probability of Engineers by Montgomeri & Runger
6. Probability & Statistics for Engineers by Johnson.

**Course Outcomes:**

1. Solve problems related to ordinary differential equations and its applications.
2. Solve linear differential equations and its applications.



3. Identify textile data for testing, test the hypothesis. Calculate and interpret large sample Z-tests. Calculate and interpret small sample t-tests. Calculate and interpret Chi-square and F-tests.
4. Apply estimation for unknown parameters. Evaluate and interpret process and lot control methods.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.3 TECHNOLOGY OF FIBRES OTHER THAN COTTON (TT)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

**Course Objectives**

1. To explain cultivation, retting and extraction/manufacturing of textiles fibres like Jute, Flax, PALF, Banana, Sisal, Bamboo, Glass wool, and silk.
2. To describe the properties and applications of Jute, Flax, PALF, Banana, Sisal, Bamboo, Glass wool, and silk.
3. To illustrate the flow chart of conversion of fibres into yarn and fabric.
4. To explain, properties and end uses of fibres yarns and fabrics of Jute, Flax, PALF, Banana, Sisal, Bamboo, Glass, wool and silk.

**1) Wool:**

- Historical and economical background of wool industries.
- Grading of wool
- Morphology and properties of wool fibre
- Process Flow chart for - Worsted and Woolen Yarns
- Comparison of Worsted and Woolen yarn process.
- Scouring, carbonizing.

**Woolen Yarn Manufacturing:**

Blending, oiling, carding, gilling and spinning.

**Worsted Yarn Manufacturing:**

- Backwashing, combing, gilling and spinning.
- Machine specifications

**2) Jute:**

- Cultivation and Extraction of Jute fibres.
- Properties of Jute fibre.
- Manufacture of Jute yarn
- Blending of Jute fibre.
- Applications

**3) Flax (Linen):**

- Cultivation and Extraction of Flax fibres.
- Properties of Flax fibre.
- Conversion of Flax fibres into yarn
- Applications.

**4) Silk:**

- Historical and economical background of silk.
- Silk fibre properties
- Mulberry cultivation
- cocoon production
- Rearing of silk worms.

**5) Raw Silk Manufacturing**

- Cocoon storing, cooking, brushing
- Charka reeling
- Cottage basin and Filature reeling
- Properties of raw silk
- Testing of raw silk

**Spun silk Yarn Manufacturing:**

- Degumming, drawing and spinning, Blending opportunities in silk

**Weaving of Silk Yarns:**

Modifications requirement on loom for weaving silk filament/yarns.

**6) Glass:**

- Glass fibre characteristics
- Manufacture of glass fibre / filament.
- Type of Textile grade glass and weaving of glass.
- Application of glass fibres / filament / fabrics.

**7) Long Vegetables fibres:**

- Sisal, Pineapple leaf (PLF), Banana, Bamboo.
- Study of properties, extraction methods.
- Blending opportunities and applications.

## Reference Books:-

### Wool

1. Wool Hand Book vol. I & II by, Warner Von Besgen.
2. Woolen Yarn Manufacturing Textile Progress Vol.15 No.12
3. Hand book of worsted and wool blended suiting process by R. S. Tomar
4. Wool Printings and Dyeing Textile Progress Vol 12 No.3
5. Woolen and Worsted Spinning by V Collins Miles

### Silk

1. Hand Book of Practical Sericulture by S.R. Ullal and M.N. Narsimayya.
2. Hand Book of Silk Technology by T.N. Sonwalkar.
3. Silk Exports and Developments by T.D. Koshi.
4. Chemical Processing of Silk by M.L. Gulrajani.
5. Production, Processing and Marketing of Silk by Mahesh Nanawati.

### Jute/Flax/Ramie/Hemp

1. Long Vegetable Fibres Textile Progress Vol.4 No.4
2. Hand Book of Jute Vol.I, II & IV by T.C. Ranjan.

### Pineapple Fibre

- 1) Pineapple Leaf Fibres Textile Progress Vol.24.
- 2) [www.fibre2fashion.com/industry.../45/.../extraction-of-pineapple-leaf](http://www.fibre2fashion.com/industry.../45/.../extraction-of-pineapple-leaf)
- 3) [www.thehindu.com/...extract...fibre...pineapple.../article](http://www.thehindu.com/...extract...fibre...pineapple.../article)

### Banana Fibre

1. [www.teonline.com](http://www.teonline.com) › Knowledge Center › Academic Reports
2. [www.teonline.com](http://www.teonline.com) › Fibers › Natural Fiber › Plant Fiber
3. [www.bananafibre.com/bananafibre.html](http://www.bananafibre.com/bananafibre.html)

### Sisal Fibre

1. <https://en.wikipedia.org/wiki/Sisal>
2. [www.sisal.ws](http://www.sisal.ws)
3. [www.fao.org/economic/futurefibres/fibres/sisal/en/](http://www.fao.org/economic/futurefibres/fibres/sisal/en/)

### Glass Fibre

1. Fibre Glass by J.Giltest Mahr & William P. R
2. Inorganic Fibres by C.Z. Cenol.
3. [www.epa.gov/ttnchie1/ap42/ch11/final/c11s13.pdf](http://www.epa.gov/ttnchie1/ap42/ch11/final/c11s13.pdf)
4. [www.slideshare.net/.../glass-fiber-manufacture-and-applications](http://www.slideshare.net/.../glass-fiber-manufacture-and-applications)

5. [textilelearner.blogspot.com/.../glass-fiber-types-of-glass-fiber\\_3834.html](http://textilelearner.blogspot.com/.../glass-fiber-types-of-glass-fiber_3834.html)
6. [www.academia.edu/.../GLASS\\_Fibres\\_manufacturing\\_properties](http://www.academia.edu/.../GLASS_Fibres_manufacturing_properties)

**Bamboo fibre**

1. [www.fibre2fashion.com/.../47/.../bamboo-fibres-a-boon-for-apparels1.as](http://www.fibre2fashion.com/.../47/.../bamboo-fibres-a-boon-for-apparels1.as)
2. [waset.org/.../bamboo-fibre-extraction-and-its-reinforced-polymer-compo..](http://waset.org/.../bamboo-fibre-extraction-and-its-reinforced-polymer-compo..)
3. [www.fibre2fashion.com/industry-article/.../benefits-of-bamboo-fabric1.a](http://www.fibre2fashion.com/industry-article/.../benefits-of-bamboo-fabric1.a)
4. [bamboovillage.com.au/about-bamboo/](http://bamboovillage.com.au/about-bamboo/)
5. [www.swicofil.com/bamboo.pdf](http://www.swicofil.com/bamboo.pdf)
6. [www.bambus.rwth-aachen.de](http://www.bambus.rwth-aachen.de)

**Course Outcomes:**

1. Understand process of cultivation, retting, extracting/ manufacturing methods of jute, flax, PALF, banana, sisal, bamboo, glass, wool and silk.
2. Compare the different fibres based on their properties.
3. Apply the knowledge of fibre data to the produce fabrics for different end uses.
4. Apply the knowledge of fibre properties for product development.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.4 TEXTILE TESTING - I (TT)**

Lectures	:	4 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	50 Marks
Subject Total	:	200 Marks

**Course Objectives**

1. To explain significance and selection of sample
2. To discuss technical significance of fibre properties.
3. To describe testing methodologies for evaluation of fibre properties.
4. To explain significance of moisture in textiles and its measurement.

**1. Sampling for determination of fibre properties**

Necessity of sampling, Terms: Population, Sample, Random sample, biased sample, Factors governing sampling, Sampling methods - Zoning method, Squaring method, Cut squaring method, Core sampling method.

**2. Longitudinal dimensions (Fibre length)**

Concept, Technical Significance of fibre length, Staple length of cotton, Length- frequency diagrams, Fibre length measurement - Oil plate method , Comb sorter method, Scanning method - Digital Fibrograph.

**3. Transverse dimensions (Fineness & Maturity)**

Fibre Fineness: Concept, Measures of fineness, Technical significance of fineness, Measurement of fineness - Microscopic method, Gravimetric method, Airflow method - Sheffield Micronaire.

Fibre Maturity: Concept, Measures of maturity, Technical significance of maturity, Measurement of maturity - Caustic soda method, Polarized light method, Differential dyeing method.

**4. Fibre strength**

Terms and definitions, Stress-strain curve, Importance of Tensile properties, Factors influencing fibre strength, Types of loading, Measurement of fibre strength - Single fibre strength –Strain gauge transducer principle, Bundle fibre strength – Pendulum lever principle , Comparison of Single fibre strength and Bundle fibre strength.

**5. Moisture relations and testing**

Terms and definitions, Effect of moisture on textiles, Regain–humidity relationships, factors affecting moisture regain, Measurement of atmospheric conditions- dry and wet bulb hygrometer, hair hygrometer, electrolytic hygrometer, measurement of regain –oven dry method, methods based on resistance and capacitance principles.

**6. Miscellaneous testing -**

Trash: Classification of trash, Technical significance of trash, estimation of trash content in cotton by Trash analyser.

Neps – Concept, Classification of Neps, importance, Neps in card web – Shirley template method, nepping potential.

Honey dew Content – Concept, Significance and estimation of honey dew content

Fibre Density – Concept, Measurement of fibre density

Fibre Quality Index and its significance

**7. Modern fibre testing instruments: -**

High Volume Instrument (HVI), Advanced Fibre Information System (AFIS).

**8. Testing of Manmade Fibres: -**

a) Linear Density – Gravimetric method, Vibroscopic method

b) Crimp – Significance, Measurement, staple fibre, Crimp Rigidity and Crimp Contraction

c) Shrinkage

d) Spin Finish

### **List of Experiment**

1. Study of Zoning technique for selection of fibre sample
2. Fibre Length by using Grease Plate Method
3. Comb Sorter method for estimation of fibre length parameters
4. Fibre Fineness by Cut-Weight Method
5. Measurement of fibre fineness and maturity by airflow instrument
6. Fibre Maturity Measurement by Caustic Soda Method
7. Determination of trash content in cotton using Trash Analyser
8. Study of fibre parameters on AFIS
9. Study of fibre parameters on HVI
10. Determination of Neps in Card web by Shirley Template
11. Determination of moisture content and regain by oven dry method
12. Determination of moisture content by Shirley Moisture meter
13. Detection of Honey Dew content in cotton fibre
14. Identification of textile fibre
15. Evaluation of crimp rigidity and crimp contraction of man-made fibre.
16. Estimation of spin finish.

### **Reference Books:-**

1. Principles of Textile Testing, J.E.Booth, CBS Publishers & Distributors, 1996.
2. Physical Properties of Fibres, Morton and Hearle
3. Manuals of HVI, AFIS
4. Manual of Spinning, P. Lord.
5. Physical Testing of textiles, B. P. Saville.
6. Handbook of Indian Standards.

### **Course Outcomes**

Students will be able

1. To select sample.
2. To understand technical significance of fibre properties.
3. To test and interpret results of fibre properties.
4. To understand moisture fibre relations.



**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.5 YARN FORMING TECHNOLOGY- III (TT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

- 1 To explain working principles and process parameters of combing preparatory, comber and ring frame.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber and ring frame.
- 3 Explanation to enumerate parameters influencing combing preparatory, comber and ring frame.
- 4 Describe utilities, maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber and ring frame and acquaint the students with industrial working by organizing industrial visits.

**1) Comber Preparatory:**

Requirements of good lap – importance of number of passages, importance of good lap, linear density of lap, etc. Methods of comber lap preparation – Different sequences of comber lap preparation, study of sliver lap machine, ribbon lap machine, unilap machine. Developments in combing preparatory machines. Maintenance & Assessment of combing preparatory machines.

**2) Combing Process and Constructional Details of Comber:**

Objects of combing process. Study of combing cycle. Constructional details of Comber- feeding, nipper assembly, cylinder and detaching rollers, cylinder needles, web and sliver transport, drafting and coiling at comber. Semi combing, normal combing, super combing and double combing. Forward and backward

feed in combing. Maintenance of comber. Index Cycle, Comber Settings.

**3) Assessment of Performance of Comber –**

Norms for production, speed. Combing efficiency, Fractionating efficiency of comber. Influence of combing operation on quality.

**4) Automation of Comber:**

Automatic and centralized noil collection. Automatic material handling. Stop motions in comber. Technical specifications of modern combers, available in the world market. Role of utilities in modern comber.

**5) Ring Spinning Process and Constructional Details of Ring Frame:**

Objects and principle of operation, Creel, Drafting System, Top arm roller weighting, Spindle and driving arrangement, The thread guide devices, The balloon control ring and the separator and their function, importance design features and settings, Ring and Traveller, Study of building mechanism.

**6) Spinning Geometry and Yarn Tension:**

Importance, effect of spinning angle, Drafting angle, spinning triangle. Study of yarn tension variation and factors.

**7) Automation of Ring Frame**

Monitoring of Ring frame Operation, Pneumafil and overhead cleaners, Auto doffing, Basics of Compact Spinning.

**8) Selection of Specification, Defects and Remedies:**

Selection of specifications depending on count and material being processed. Defective production of ring frame and remedies. Routine maintenance schedule of ring frames Relative Humidification requirement and its importance.

**List of Experiments:-**

**Any twelve experiments in a term are to be conducted.**

1. Driving arrangement & calculations of Sliver lap machine.

2. Driving arrangement & calculations of Ribbon lap machine.
3. Study of roller settings in sliver lap and ribbon lap machines.
4. Study of constructional aspects, combing cycle & index chart of modern comber.
5. Driving arrangement & calculations in modern comber.
6. Study of Comber setting.
7. Driving arrangement & calculations related to production, constants, draft twist etc. of modern Ring frame.
8. Study of ring frame settings and spinning geometry.
9. Study of building mechanism of Ring frame.
10. Mill visit to study modern Comber, Ring frame.
11. Study of working principle, roller setting and lap forming in sliver lap machine.
12. Study of working principle, roller setting and lap forming in ribbon lap machine.
13. Study of performance assessment of comber.
14. Study of performance assessment of Ring frame.
15. Study of utilities on comber and ring frame.
16. Study of variable drives on ring frame.

**Reference Books:-**

1. The Textile Institute Publication –Manual of Textile Technology-Short Staple Spinning Series Vol I to V by W. Klein Vol III-A Practical training guide to Combing & Drawing by W.Klein
1. Practical guide to combing by W.Klein, Textile Institute publication Vol.3
2. Technology of cotton spinning by J.Janakiram.
3. Drawing, Combing and roving and speed frame by Zoltan, S.Szaloky, The Institute of Textile Technology, Virginia
4. Draw frame, combing and speed frame by J.H.Black; The Textile Institute publication, Manual of cotton spinning Vol-Iv part II.
5. Spun Yarn Technology by Eric Oxtoby.
6. Elements of combing by A.R.Khare.
7. Cotton Drawing and Roving by G.R.Merril.
8. Manual of cotton spinning series, vol3, part 2 by J.Black et al Textile Institute Publication.

**Course Outcomes**

- 1 Students should be able to understand the working principles and process parameters of combing preparatory, comber and ring frame.
- 2 Understand the constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber and ring frame.
- 3 Students should estimate parameters related to combing preparatory, comber and ring frame.
- 4 Students should understand maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber and ring frame.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.6 FABRIC FORMING TECHNOLOGY- III (TT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objective**

- 1 To explain design features, construction & working and related problems of mechanisms of modern automatic winding machines, and modern warping machines and Evaluation of the production and efficiency in winding and warping processes
- 2 To explain design features, construction & working and related problems of mechanisms of automatic looms
- 3 To explain various weaves (Design, draft & peg plan), weave characteristics and weaving requirements and their applications
- 4 To demonstrate the correct settings, fitting and operations of mechanisms on winding, warping machines, automatic looms, analyzing fabric details and acquaint the students with industrial working by organizing industrial visits.

**1) Automatic Weaving**

- a) Limitations of ordinary looms: - Production, efficiency, quality and allocation, objectives for developing automatic looms, scope for automation.
- b) Design features of automatic looms: - Drives, loom motions, accessories and other critical features of automatic looms.
- c) Weft feelers: - Construction working of side sweep (Cimmco and Ruti-B Type), electrical (Ruti-C Type) and electronic weft feelers, their merits, demerits and applications.
- d) Transfer mechanism: - Cimmco and Ruti-C transfer motion's working and construction, shuttle protector, temple and shuttle eye cutter. Requirement for successful transfer of pirn, reasons of stripping, bottoms and remedies. Shuttle changing mechanism and safety motion, its applications.
- e) Automatic let-off motion: - Principles and requirements of automatic let-off

mechanism, types, construction and working of Cimmco, Ruti-B, Ruti-C type let-off motions.

- f) Warp stop motion: - Types, Construction and working of mechanical and electrical warp stop motion, Types of drop pins, specifications and applications.
- g) Centre weft fork: - Construction and working of Ruti-C type centre weft fork motion and its advantages.
- h) Operator assisting motions: - Pick finding, heald levelling, light indicators; pick counters need, functions and use.
- i) Auto loom fabric defects, causes and remedies, Calculations.

## 2) Fabric Structure

Study of following weaves (Design, draft and peg plan) and weave characteristics and weaving requirements.

- a) Stripe and check weave combination - selection of weaves, joining of weaves, firmness, classification and construction of designs.
- b) Colour and weave effect.
- c) Simple spot designs.
- d) Backed fabrics - Warp, weft and wadding backed fabrics.
- e) Bed ford words - Plain, twill, wadded, Crepon cords,
- f) Welt and Pique: - Plain, wadded and waved pique.
- g) Double cloth: - Object, classification, self stitched double cloth; centre stitched double cloths, interchanging double cloth, multiplayer fabrics. Selection of face and back weaves type of stitching points and their selection, wadded double cloth.

## 3) Automatic Winding

- a) Concept of P and Q winding, their applications.
- b) Technical requirements of winding process with respect to : i) Yarn unwinding, ii) Yarn take-up iii) Yarn tensioning, iv) Wound package requirements for warping, knitting and weaving.
- c) Construction of automatic winding machines: Design features, of Creel, kink remover, unwinding accelerator, pre cleaner, tensioner, waxing unit, cradle etc.
- d) Drive to drums, scroll details, super drum details and advantages, braking etc. (Autoconer: 238, 338, Savio: Espero and Orion, Murata - 21 C, 7 -V.)

- e) Special features of all models, blowers, air consumption and power requirements etc.
- h) Yarn Clearing :-i) Technical back ground, ii) Optimum clearing, iii) Uster Classimat as an aid for yarn clearing and fault classification in latest models.
- i) Electronic yarn clearers:i) Optical and capacitance, Lofe, TK 930F, TK 950H, Quantum-II, III,IV, ii) capabilities with respect to fault and contamination removal etc., iii) Detailed method of setting of optical and capacitance type clearer (for carded and combed yarns) w.r.t. N, DS, DL, LL,-D,-L, C, Cluster setting, splicer setting, extended splicer setting for various yarn counts and materials. iv) Siro cuts: concept, classification.
- j) Knot factor and clearing efficiency and its use as an aid to assess the performance of winding machines.
- k) Splicing : i). Types – mechanical, pneumatic, aqua and thermal, construction, parameters, their applications and comparison. ii) Splice quality assessment (strength, appearance, hairiness) iii). Maintenance of splicers.
- l) Package Quality: i) Details of package faults observed on automatic winding machines causes and remedies, ii) Mechanism for anti patterning, maximum diameter of package, automatic doffing and restarting of winding head.
- m) Calculations: - Spindle Efficiency, production and allocation.

#### **4) Modern Warping**

- a) Constructional details and features of modern warping machines. Such as Benninger, West Point, Sucker-Muller, Tsudakoma, Hacoba and Karl Mayer with reference to design of creel, pre-tensioner, automatic adjustment of central control of tensioner.
- b) Types of creels – pitch and its importance, magazine, truck, chain creels, semi-automatic and fully automatic creels, creel - master, and auto plan for colour patterns.
- c) Head Stock - i) Beam warping - Auto leasing, drive, brakes and automatic doffing and donning,
- d) Sectional warping - Auto leasing, drum traverse and cone angle adjustment, beam traverse and its adjustment, iii) MIS systems and its use.

**List of Experiments:-**

- 1) Dismantling and resetting of under pick motion.
- 2) Dismantling and resetting of Cimmco weft feeler motion.
- 3) Dismantling and resetting of Cimmco auto let-off motion.
- 4) Setting of pirn transfer mechanism
- 5) Dismantling and resetting of clutch motion.
- 6) Study of Ruti-C loom (drive, centre weft fork, pick finding, take-up drive, back rest, multi pawl drive, shuttle construction, picking, loose reed etc)
- 7) Study of sectional warping machine- drive, warping speed, beaming speed, reed and beam traverse speed, production and efficiency.
- 8) Study of Laxmi and Senmet pirn winding machine
- 9) Study of splicing parameters on splice quality and appearance
- 10) Setting of warp stop motion
- 11) Fabric analysis - Extra warp, weft, Bedford, cord, pique, leno, double cloth, pile fabric.
- 12) Fabric analysis - Extra warp, weft, Bedford cord, pique, leno, double cloth, pile fabric.
- 13) Fabric analysis - Extra warp, weft, Bedford, cord, pique, leno, double cloth, pile fabric.
- 14) Visit to Automatic winding unit.
- 15) Visit to Automatic loom unit.
- 16) Visit to modern warping unit

**Reference Books:-**

1. Principles of Weaving by Marks A.T.C. and Robinson.
2. Textile Colour and Design by Watson.
3. Advanced Textile Colour and Design by Watson
4. Weaving Machines, Materials and Methods by Prof. M.K. Talukdar, Prof.D.B. Ajgaonkar etc.
5. Textile Mathematics - Vol.-I and II by J.E. Booth.
6. Modern Preparation and Weaving Machines by A. Ormerod.



**Course Outcome**

Student will be able to,

- 1 Understand design features, construction & working and related problems of mechanisms of modern automatic winding machines, and modern warping machines and Calculate the production and efficiency in winding and warping processes.
- 2 Understand design features, construction & working and related problems of mechanisms of automatic looms
- 3 Construct various weaves (Design, draft & peg plan), weave characteristics and weaving requirements and their applications
- 4 Understand the correct settings, fitting and operations of mechanisms on winding, warping machines and automatic looms and analyzing fabric details.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.7 TEXTILE DESIGN AND COLOUR (TT/MMTT)**

Practical	:	2 Hours / Week
Term Work	:	50 Marks
Subject Total	:	50 Marks

**Course Objectives**

1. To apply various elements of art, color modification and color theories for textile design development.
2. To develop textile design development with the help of designing principles.
3. To compose textile design with different bases.
4. To create dobby and jacquard designs on point paper.

1. Elements of art- Line, Direction, Size, Shape, Colour, Value, Texture.
2. Colour modification chart- Primary, Secondary and Tertiary colour modification.
3. Colour theory chart - Pigment theory of colour (Subtractive) and light theory of colour(Additive).
4. Textile design development with the help of designing principles - Principle of Repetitions, Principle of Alteration (Change in colour, Change in size, Change in direction, Permutation and combination), Grade, Harmony, Balance, Contrast, Dominance.
5. Composition of all over textile design by following bases- Rectangle base, Drop base – half drop, full drop, Diamond base, Ogee base, Sateen base.
6. Development of point paper design for dobby weaving.
7. Development of point paper design for jacquard- Extra warp
8. Designing different motifs, colour pattern for jacquard weaving.

**Reference Books:-**

1. "Textile design and colour- Elementary weaves and figured fabrics", William Watson.
2. "Fabric structure and design"- N. Gokarneshan.

3. "Woven Structures and Design "-Doris Goerner.
4. "Handbook of textile design- principles, processes and practice" - Jacquie Wilson, The Textile Institute, Wood head Publishing Limited.
5. "Encyclopedia of clothing and fashion- Vol-1,Vol-2,Vol-3" – Christopher Beward, Charles scribner sons.

**Course Outcome**

Student will be able to,

1. Understand various elements of art, color modification and color theory charts for textile design development
2. Develop textile design development with the help of designing principles.
3. Compose textile design with different bases.
4. Create dobby and jacquard designs on point paper.

## **SECOND YEAR B. TEXT. – SEMESTER – I**

### **3.3 POLYMER SCIENCE (MMTT/TC)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

#### **Course Objectives:**

1. To describe the basic determinants of fibre forming polymers.
2. To discuss condensation, addition and co-polymerization.
3. To discuss the techniques of polymerization and polymer degradation.
4. To explain the concept of molecular weight of polymers.

#### **Chapter –I : Basic Determinants of Fibre Forming Polymers :-**

Importance of polymer science. Various applications of polymers. Classification of polymers. Definition of monomer, oligomer, high polymer, mesomer, cohesive energy density, solubility parameter, glass transition temperature, functionality and degree of polymerization. Concept of basic determinants of fibre forming polymer. Effect of molecular weight, Symmetry, rigidity and chemical reactivity of polymeric chain on the properties of polymer. Concept of rubber, plastic and fibre. Essential requirements of suitability of a polymer for apparel wear and industrial applications.

#### **Chapter –II : Condensation Polymerization :-**

Mechanism, types, features, essential requirements and importance of condensation polymerization. Carother's equation. Significance of Carother's equation. Concept of gelation & cyclic polymer formation. Effect of functionality on gelation. Factors affecting cyclization. Kinetics of condensation polymerisation. Stoichiometry of reactants and degree of polymerization.

#### **Chapter-III : Addition polymerization :-**

Mechanism, types, features and essential requirements of addition polymerization. Types of initiation, chemistry of initiators, retarders and inhibitors. Effect of catalyst, temperature, pressure, solvents, modifiers,

emulsifying and suspending agents on addition polymerisation. Kinetics of addition polymerisation. Industrial applications of addition polymerisation.

#### **Chapter-IV: Co-polymerization :-**

Concept of graft and block co-polymerization and their importance. Various techniques of grafting. Various factors such as temperature, time, dose-rate, concentration of monomers, diffusion, scavengers, initiators & physical state on co-polymerization. Concept of ideal, alternating and azeotropic co-polymers. Reactivity ratios of monomers and its significance. Concept of Q-e scheme. Kinetics of co-polymerisation.

#### **Chapter-V: Techniques of polymerization:–**

Study of various techniques of polymerisation such as bulk, solution, suspension, emulsion, solid state, plasma polymerization.

#### **Chapter-VI: Molecular Weight :-**

Concept of  $\overline{M}_n$   $\overline{M}_w$  and poly-dispersibility & their significance. Effects of molecular weight distribution of polymer on spinnability & drawability. Light scattering and ultra centrifuge techniques to determine  $\overline{M}_w$ . Endgroup analysis, osmotic pressure, cryoscopic methods & viscosity methods to determine  $\overline{M}_n$  &  $\overline{M}_v$ . Characteristics of polymer using DSC, TGA, DTA, DMA and GPC.

#### **Chapter-VII : Polymer Degradation –**

Concept of chain end and random polymer degradation. Study of polymer degradation by thermal, mechanical, chemical and other agencies.

#### **Reference Books:-**

1. Polymer sciences and technology by Joel R. Fried.
2. Text book of polymer science by Fred W. Billmeyer, Jr.
3. Polymers and their properties by J.W.S. Hearle.
4. Organic chemistry of high polymers by Lenz.
5. Applied Polymer science by Flory.
6. Fundamentals of polymers by Anilkumar and Rakesh K. Gupta.

7. Principles of Polymerisation by George Odian.
8. Polymer science by Steven.
9. Introduction to polymer chemistry by G.S. Mishra.
10. Polymer science and technology of plastics & rubbers by Dr. Premamoy Ghosh.
11. Polymer Science by V.R. Gowarikar, N.V. Viswanathan & Jaydev Shreedhar.

**Course Outcome**

Student will be able to,

1. Understand the basic determinants of fibre forming polymers
2. Explain the mechanisms of condensation, addition and co-polymerization
3. Explain the techniques of polymerization and polymer degradation.
4. Understand the concept of molecular weight of polymers

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.4 MAN MADE FIBRE MANUFACTURE - I (MMTT)**

Lectures	:	4 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	50 Marks
Subject Total	:	200 Marks

**Course Objectives:**

1. To explain structural principles of fibre forming polymers and fibre spg processes
2. To explain the process, variables and developments of melt and solution spinning processes.
3. To describe the composition, requirements and application methods of spin finish
4. To demonstrate manufacturing processes of undrawn and drawn filament yarns

**Course Content:**

**UNIT- 1**

Structural Principles of Textile Fibres:-

Monomer, Polymer, Requirements of polymer to form fibre, polymers as fibres, plastics and rubbers. molecular size & its interaction, molecular orientation and crystallinity in fibres,

**UNIT- 2**

Physical Fundamentals of the Fibre Spinning Process:-

Fibre forming processes, General principles of the spinning process, principles of solidification in spinning process, Rheology of spinning, shear flow and elongational flow, Flow instabilities, spinnability of liquids, Formation of fibre structure:

### **UNIT- 3**

Principles of Melt Spinning:-

General features of the melt spinning process for filament yarn and staple fibres production, Melt spinning devices such as extruders, static mixer, pre-filtration, manifold, spinpack, cooling devices, T-up winders. Melt spinning variables and calculations related to production, spinning pump speed and polymer output rate. Role of some critical parameters and their variation along spinning line. Profile of polymer jet and velocity distribution. Effect of orientation and crystallinity on the behaviour of undrawn fibres, Non-steady state spinning conditions and non-uniform fibers. Direct melt spinning, spin draw process.

### **UNIT- 4**

Spin finish: Composition of spin finish, Requirements of good spin finish, Methods of applications of spin finish.

### **UNIT- 5**

Principles of Solution Spinning Process:-

Fundamental aspects of wet spinning process, Preparation of spinning solution, post spinning operations, fibre formation and coagulation variables.

Fundamental aspects of dry spinning process, extrusion, spinning, theory of filament formation, stretching, dry-jet wet spinning process.

### **UNIT- 6**

Drawing of Melt Spun Fibres:-

Need for drawing melt spun fibres, drawing behaviour of thermoplastic fibres, Drawing unit, Influence of drawing on structure and properties of filament yarns, draw warping.

### **UNIT- 7.**

Heat Setting of Thermoplastic Fibres: -

Nature of set, Heat setting behavior of different yarns, settability and measurement of degree of set.



**List of Experiments:-**

1. Demonstrations of pilot melt spinning unit and production of filament yarn.
2. Demonstrations of pilot melt spinning and drawing unit and production of filament yarn.
3. Demonstration of laboratory filament yarn drawing machine and drawing of undrawn yarns.
4. Demonstrations of laboratory solution spinning machine and production of filament yarn.
5. Measurement of MFI of given polymer using KAYJAY MFI testing apparatus.
6. Effect of temperature on MFI and Melt Index Spread of polymers.
7. Effect of melt spinning extrusion temperature on characteristics of filament yarn
8. Effect of melt spinning delivery speed on the characteristics of filament yarn.
9. Effect of melt spinning length on the characteristics of filament yarn.
10. The effect of draw ratio on properties of drawn filament yarns
11. The effect of drawing temperature on properties of drawn filament yarns
12. The effect of number of wrappings on godet of drawing machine on properties of drawn filament yarns
13. Comparison of properties of single and multi stage drawn filament yarns characteristics
14. Comparison of the characteristics of cold and hot drawn filament yarns.
15. Maintenance of spin pack.
16. Industrial visit.

**List of References:-**

1. Fundamentals of Fibre Formation: The Science of Fibre Spinning and Drawing, [Andrzej Ziabicki](#), Wiley, 1976.
2. High speed spinning - Ziabicki and Kawai , [Woodhead Publishing](#)
3. Man Made fibre science and technology - Marks and Allas. Wiley interscience New York, 1968.
4. Manufactured fibre technology - Edited By V.B. Gupta, and V.K. Kothari, Springer Science business Media
5. Production of synthetic fibres – A.A. Vaidya.
6. Book of papers of NCUTE Programmes on Man Made fibres.

7. Setting of fibres and fabrics – Hearle J.W.S. & Miles L.W.C.

**Course Outcomes:**

Students will be able to:

1. Understand structural principles of fibre forming polymers and principles of fibre spinning processes
2. Understand the process of melt and solution spinning processes and analyze influence of process variables on characteristics of fibres
3. Choose and apply spin finish on fibres
4. Produce undrawn and drawn filament yarns

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.5 MAN MADE STAPLE YARN MANUFACTURE - III (MMTT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

- 1 To explain working principles and process parameters of combing preparatory, comber and ring frame.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber and ring frame.
- 3 Explanation to enumerate parameters influencing combing preparatory, comber and ring frame.
- 4 Describe utilities, maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber and ring frame and acquaint the students with industrial working by organizing industrial visits.

**1) Comber Preparatory:**

Requirements of good lap – importance of number of passages, importance of good lap, linear density of lap, etc. Methods of comber lap preparation – Different sequences of comber lap preparation, study of sliver lap machine, ribbon lap machine, unilap machine. Developments in combing preparatory machines. Maintenance & Assessment of combing preparatory machines with special reference to man made fibres.

**2) Combing Process And Constructional Details Of Comber:**

Objects of combing process. Study of combing cycle. Constructional details of Comber- feeding, nipper assembly, cylinder and detaching rollers, cylinder needles, web and sliver transport, drafting and coiling at comber. Semi combing, normal combing, super combing and double combing.

Forward and backward feed in combing. Maintenance of comber. Index Cycle, Comber Settings with special reference to man made fibres.

**3) Assessment Of Performance Of Comber –**

Norms for production, speed. Combing efficiency, Fractionating efficiency of comber. Influence of combing operation on quality.

**4) Automation Of Comber:**

Automatic and centralized noil collection. Automatic material handling. Stop motions in comber. Technical specifications of modern combers, available in the world market. Role of utilities in modern comber.

**5) Ring Spinning Process And Constructional Details Of Ring Frame:**

Objects and principle of operation, Creel, Drafting System, Top arm roller weighting, Spindle and driving arrangement, The thread guide devices, The balloon control ring and the separator and their function, importance design features and settings, Ring and Traveller, Study of building mechanism with special reference to man made fibres.

**6) Spinning Geometry And Yarn Tension:**

Importance, effect of spinning angle, Drafting angle, spinning triangle. Study of yarn tension variation and factors.

**7) Automation Of Ring Frame**

Monitoring of Ring frame Operation, Pneumafil and overhead cleaners, Auto doffing, Basics of Compact Spinning.

**8) Selection Of Specification, Defects And Remedies:**

Selection of specifications depending on count and material being processed. Defective production of ring frame and remedies. Routine maintenance schedule of ring frames Relative Humidification requirement and its importance.

**List of Experiments:-**

**Any twelve experiments in a term are to be conducted.**

1. Driving arrangement & calculations of Sliver lap machine.
2. Driving arrangement & calculations of Ribbon lap machine.
3. Study of roller settings in sliver lap and ribbon lap machines.
4. Study of constructional aspects, combing cycle & index chart of modern comber.
5. Driving arrangement & calculations in modern comber.
6. Study of Comber setting.
7. Driving arrangement & calculations related to production, constants, draft twist etc. of modern Ring frame.
8. Study of ring frame settings and spinning geometry.
9. Study of building mechanism of Ring frame.
10. Mill visit to study modern Comber, Ring frame.
11. Study of working principle, roller setting and lap forming in sliver lap machine.
12. Study of working principle, roller setting and lap forming in ribbon lap machine.
13. Study of performance assessment of comber.
14. Study of performance assessment of Ring frame.
15. Study of utilities on comber and ring frame.
16. Study of variable drives on ring frame.

**Reference Books:-**

1. The Textile Institute Publication –Manual of Textile Technology-Short Staple Spinning Series Vol I to V by W. Klein Vol III-A Practical training guide to Combing & Drawing by W.Klein
2. Practical guide to combing by W.Klein, Textile Institute publication Vol.3
3. Technology of cotton spinning by J.Janakiram.
4. Drawing, Combing and roving and speed frame by Zoltan, S.Szaloky, The Institute of Textile Technology, Virginia
5. Draw frame, combing and speed frame by J.H.Black; The Textile Institute publication, Manual of cotton spinning Vol-IV part II.
6. Spun Yarn Technology by Eric Oxtoby.
7. Elements of combing by A.R.Khare.

8. Cotton Drawing and Roving by G.R.Merril.
9. Manual of cotton spinning series, vol3, part 2 by J.Black et al Textile Institute Publication.

**Course Outcomes**

- 1 Students should be able to understand the working principles and process parameters of combing preparatory, comber and ring frame.
- 2 Understand the constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber and ring frame.
- 3 Students should estimate parameters related to combing preparatory, comber and ring frame.
- 4 Students should understand maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber and ring frame.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.6 MAN MADE FABRIC FORMING TECHNOLOGY - III (MMTT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

- 1 To explain design features, construction & working and related problems of mechanisms of modern automatic winding machines, and modern warping machines and Evaluation of the production and efficiency in winding and warping processes
- 2 To explain design features, construction & working and related problems of mechanisms of automatic looms
- 3 To explain various weaves (Design, draft & peg plan), weave characteristics and weaving requirements and their applications
- 4 To demonstrate the correct settings, fitting and operations of mechanisms on winding, warping machines, automatic looms, analyzing fabric details and acquaint the students with industrial working by organizing industrial visits.

**1) Automatic Weaving**

- a. Limitations of ordinary looms: - Production, efficiency, quality and allocation, objectives for developing automatic looms, scope for automation.
- b. Design features of automatic looms: - Drives, loom motions, accessories and other critical features of automatic looms.
- c. Weft feelers: - Construction working of side sweep (Cimmco and Ruti-B Type), electrical (Ruti-C Type) and electronic weft feelers, their merits, demerits and applications.
- d. Transfer mechanism: - Cimmco and Ruti-C transfer motion's working and construction, shuttle protector, temple and shuttle eye cutter. Requirement for successful transfer of pirn, reasons of stripping, bottoms and remedies. Shuttle changing mechanism and safety motion, its applications.
- e. Automatic let-off motion: - Principles and requirements of automatic let-off

- mechanism, types, construction and working of Cimmco, Ruti-B, Ruti-C type let-off motions.
- f. Warp stop motion: - Types, Construction and working of mechanical and electrical warp stop motion, Types of drop pins, specifications and applications.
  - g. Centre weft fork: - Construction and working of Ruti-C type centre weft fork motion and its advantages.
  - h. Operator assisting motions: - Pick finding, heald levelling, light indicators; pick counters need, functions and use.
  - i. Auto loom fabric defects, causes and remedies, Calculations.

## 2) Fabric Structure

Study of following weaves (Design, draft and peg plan) and weave characteristics and weaving requirements.

- n) Stripe and check weave combination - selection of weaves, joining of weaves, firmness, classification and construction of designs.
- o) Colour and weave effect.
- p) Simple spot designs.
- q) Backed fabrics - Warp, weft and wadding backed fabrics.
- r) Bed ford words - Plain, twill, wadded, Crepon cords,
- s) Welt and Pique: - Plain, wadded and waved pique.
- t) Double cloth: - Object, classification, self stitched double cloth; centre stitched double cloths, interchanging double cloth, multiplayer fabrics. Selection of face and back weaves type of stitching points and their selection, wadded double cloth.

## 3) Automatic Winding

- f) Concept of P and Q winding, their applications.
- g) Technical requirements of winding process with respect to : i) Yarn unwinding, ii) Yarn take-up iii) Yarn tensioning, iv) Wound package requirements for warping, knitting and weaving.
- h) Construction of automatic winding machines: Design features, of Creel, kink remover, unwinding accelerator, pre cleaner, tensioner, waxing unit, cradle etc.
- i) Drive to drums, scroll details, super drum details and advantages, braking etc. (Autoconer: 238, 338, Savio: Espero and Orion, Murata - 21 C, 7 -V.)



- j) Special features of all models, blowers, air consumption and power requirements etc.
- u) Yarn Clearing :-i) Technical back ground, ii) Optimum clearing, iii) Uster Classimat as an aid for yarn clearing and fault classification in latest models.
- v) Electronic yarn clearers:i) Optical and capacitance, Loefe, TK 930F, TK 950H, Quantum-II, III,IV, ii) capabilities with respect to fault and contamination removal etc., iii) Detailed method of setting of optical and capacitance type clearer (for carded and combed yarns) w.r.t. N, DS, DL, LL,-D,-L, C, Cluster setting, splicer setting, extended splicer setting for various yarn counts and materials. iv) Siro cuts: concept, classification.
- w) Knot factor and clearing efficiency and its use as an aid to assess the performance of winding machines.
- x) Splicing : i). Types – mechanical, pneumatic, aqua and thermal, construction, parameters, their applications and comparison. ii) Splice quality assessment (strength, appearance, hairiness) iii). Maintenance of splicers.
- y) Package Quality: i) Details of package faults observed on automatic winding machines causes and remedies, ii) Mechanism for anti patterning, maximum diameter of package, automatic doffing and restarting of winding head.
- z) Calculations: - Spindle Efficiency, production and allocation.

#### **4) Modern Warping**

- a. Constructional details and features of modern warping machines. Such as Benninger, West Point, Sucker-Muller, Tsudakoma, Hacoba and Karl Mayer with reference to design of creel, pre-tensioner, automatic adjustment of central control of tensioner.
- b. Types of creels – pitch and its importance, magazine, truck, chain creels, semi-automatic and fully automatic creels, creel - master, and auto plan for colour patterns.
- c. Head Stock - i) Beam warping - Auto leasing, drive, brakes and automatic doffing and donning,
- d. Sectional warping - Auto leasing, drum traverse and cone angle adjustment, beam traverse and its adjustment, iii) MIS systems and its use.

**List of Experiments:-**

- 1) Dismantling and resetting of under pick motion.
- 2) Dismantling and resetting of Cimmco weft feeler motion.
- 3) Dismantling and resetting of Cimmco auto let-off motion.
- 4) Setting of pirn transfer mechanism
- 5) Dismantling and resetting of clutch motion.
- 6) Study of Ruti-C loom (drive, centre weft fork, pick finding, take-up drive, back rest, multi pawl drive, shuttle construction, picking, loose reed etc)
- 7) Study of sectional warping machine- drive, warping speed, beaming speed, reed and beam traverse speed, production and efficiency.
- 8) Study of Laxmi and Senmet pirn winding machine
- 9) Study of splicing parameters on splice quality and appearance
- 10) Setting of warp stop motion
- 11) Fabric analysis - Extra warp, weft, Bedford, cord, pique, leno, double cloth, pile fabric.
- 12) Fabric analysis - Extra warp, weft, Bedford cord, pique, leno, double cloth, pile fabric.
- 13) Fabric analysis - Extra warp, weft, Bedford, cord, pique, leno, double cloth, pile fabric.
- 14) Visit to Automatic winding unit.
- 15) Visit to Automatic loom unit.
- 16) Visit to modern warping unit

**Reference Books:-**

1. Principles of Weaving by Marks A.T.C. and Robinson.
2. Textile Colour and Design by Watson.
3. Advanced Textile Colour and Design by Watson
4. Weaving Machines, Materials and Methods by Prof. M.K. Talukdar, Prof.D.B. Ajgaonkar etc.
5. Textile Mathematics - Vol.-I and II by J.E. Booth.
6. Modern Preparation and Weaving Machines by A. Ormerod.

**Course Outcome**

Student will be able to,

- 1 Understand design features, construction & working and related problems of mechanisms of modern automatic winding machines, and modern warping machines and Calculate the production and efficiency in winding and warping processes.
- 2 Understand design features, construction & working and related problems of mechanisms of automatic looms
- 3 Construct various weaves (Design, draft & peg plan), weave characteristics and weaving requirements and their applications
- 4 Understand the correct settings, fitting and operations of mechanisms on winding, warping machines and automatic looms and analyzing fabric details.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.3 MATERIAL ENGINEERING (TPE)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

**Course Objectives:**

1. To understand engineering materials and textile materials.
2. To get familiar with ceramic and organic materials.
3. To get acquainted with Nanotechnology, Green Chemistry, Corrosion and its preventions.
4. To understand properties of engineering materials, their types, applications, alloying, heat treatments etc. To get conversant with the electrical & magnetic materials.

**1) Introduction to Material Engineering:-**

Definition of engineering materials, classification, scope of the subject, structural studies of materials – 1) Types of bonds - a) Primary- ionic, covalent, co-ordinate, metallic etc, b) Secondary- Hydrogen bond, van der Waal forces etc, 2) Crystal structures – BCC, FCC, simple cubic etc.

**2) Properties of Engineering Materials:-**

Mechanical – Hardness, Strength, Ductility, Malleability, Machinability, Weldability, Fatigue and Creep.

Thermal – Specific heat, Thermal conductivity, Thermal expansion and Thermoelectric effect.

**3) Metallic Materials -**

Pig Iron, Wrought iron, Steel & Cast iron, classification, alloying of steel - effect of addition of elements such as C, Si, P, Mn, Ni, Mo, Co to steel. Stainless steel, Heat treatment of steels. Non-ferrous metals – Copper, Aluminium & their alloys such as Brass, Bronze, Duralumin, Alnico, Nichrome, Solder material.

#### **4) Ceramic Materials:-**

Introduction and types of ceramic materials, Abrasives, Introduction and properties of refractory materials, refractory's such as a) Chromate bricks b) Zircon bricks c) High alumina bricks and d) Porcelain. Cement, its types, manufacturing process, setting & hardening, uses.

#### **5) Organic Materials:-**

Polymers , Polymerisation, classification, types. Plastics types, properties and applications. Properties and applications of bakelite, epoxy, urea-formaldehyde resin, Nylon -6, 6, Rubber –Synthetic and natural, vulcanisation, Paints.

#### **6) Electrical and Magnetic Materials:-**

Factors affecting the resistivity of conductors, properties of materials used as electrical contact materials, electrical conductors, resistors, insulating materials. Types of insulating materials such as PVC, Mica, Fibres glass, Mineral oil and Asbestos. Magnetisation, soft and hard magnetic materials such as Iron silicon alloys, Alnico type alloys and Ferrites.

#### **7) Corrosion and its Prevention:-**

Introduction – Ionization, Electrolysis, types of corrosion & its mechanism, factors affecting rate of corrosion. Prevention of corrosion – proper selection of material and designing, alloying, metallic coatings – Electroplating, Cementation, Cladding. Passivity.

#### **8) Textile Materials:-**

Various textile materials, their properties and applications. Glass wool, Polyester film, insulation felts, filters etc. Materials used for textiles – bobbins, picker, leather, wood for shuttles, ring travellers etc.

#### **9) Composite Materials -**

Introduction, constituents of composites, types of composites, FRP and GRP, processing of fibre reinforced composites, failure of fibre reinforced composites.

### **10) Introduction to Nanotechnology and Green Chemistry :-**

Introduction, methods of synthesis of Nanoparticles, chemical bath deposition method, electrodeposition method, advantage & disadvantage of nanomaterials, applications. Green chemistry- Introduction, principles of green chemistry.

#### **Reference Books:-**

1. Material Science by R.B. Gupta.
2. Material Science by P. K. Palanisamy.
3. Properties of Engineering Materials by R. A. Higgins.
4. A Text book of Material Science by V.K. Manchanda.
5. Material Science and Engineering by V. Raghavan.
6. Material Science and Processes by S. K. Hajra Choudhary.
7. Material Science by M. V. Naik.
8. Material Science and Metallurgy by Daniel Yesudian & Harris Samuel.
9. The Nanoscope by Dr. Parag Diwan & Ashish Bharadwaj.
10. Green Chemistry: A Text book by V. K. Ahluwalia.
11. New trends in Green Chemistry by V. K. Ahluwalia & M.Kidwai.

#### **Course Outcomes:**

1. To describe engineering materials and select proper material for textile applications.
2. To explain properties & applications of various types of ceramic and organic materials.
3. To apply knowledge of Nanotechnology & Green Chemistry. To explain the process of corrosion and various methods of preventing the same.
4. To explain mechanical & thermal properties of engineering materials, their types, applications, alloying, heat treatments etc. To describe various electrical & magnetic materials.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.4 MANUFACTURING PROCESSES - II (TPE)**

Lectures	:	4 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	50 Marks
Subject Total	:	200 Marks

**Course Objectives:**

1. To understand theory of metal cutting, need of automation & stages involved in it. To get familiar with numerical control of machine tools & its concerned features.
2. To understand the concept of Non-traditional machining methods. To know various methods of protection of machined surfaces.
3. To get familiar with hot working and cold working of metals.
4. To get acquainted with various metal joining processes.

**1) Theory of Metal Cutting :-**

Mechanics of chip formation, Single point cutting tool, Determination of shear angle, Energy consideration in metal cutting, Machinability, Numericals based on above concepts.

**2) Automation of Manufacturing Processes :-**

Objectives of automation, Stages of advancement in machinery, Concept of general purpose machines & special purpose machines, In-line transfer machines, Rotary type transfer machines etc.

**3) Numerical control of Machine Tools :-**

Introduction to NC machine, CNC machine – additional features, advantages, disadvantages, application areas, parts suitable for CNC machines. DNC machines, Classification of CNC machines – according to feedback control, according to control system features, axis identification in CNC machines, ATC & Tool magazine.

**4) Non-Traditional Machining Methods (NTMM) :-**

Introduction, classification, processes such as EDM, ECM, AJM, LBM, Plasma arc cutting – principle, working, advantages, disadvantages & applications of each process.

**5) Protection of Machined Surfaces :-**

Requirement of protection/coating, coating methods such as Hot dipping, Electroplating, Galvanizing, Metal Spraying, Tinning, Painting.

**6) Mechanical Working of Metals :-**

Hot working of metals, Cold working of metals & concept about the processes like Rolling, Extrusion, Drawing, Metal Spinning.

**7) Forging :-**

Introduction, various tools used, Basic forging operations, Hand forging, machine forging, open-die forging, close-die forging, forging defects & causes.

**8) Joining Processes :-**

Welding & its types – Arc welding , Gas welding, Resistance welding, TIG welding, MIG welding, Welding defects etc. Brazing, Soldering.

**Term work (Mechanical Workshop) : -**

1. One assembly Job on fitting.
2. One assembly job of turning, containing following operations – facing, step turning, taper turning, knurling, threading etc.

**Practical Examination:-**

1. One assembly Job on fitting (Time duration 4 hrs).
2. One assembly job on turning (Time duration 4 hrs).

Total - 2 Jobs for 8 hrs. duration.

**Reference Books:-**

1. Elements of Workshop Practices (Vol. I & II) by Hazra Choudhary.
2. Production Technology by R. K. Jain.



3. A Course in Workshop Technology Vol. I & II by B. S. Raghuwanshi.
4. CNC Machines by Pabla & Adinath.
5. CAD/CAM Principles & Operations by P. N. Rao.
6. Manufacturing Engineering & Technology by Serope Kalpakjian & Steven R. Schmid.

**Course outcomes:**

Students will be able to

1. To describe theory of metal cutting. To evaluate energy required for the same & wear of the tool. To explain need of automation, NC machines & their concerned features with the help of diagrams.
2. To explain the principle, working, applications etc. of Non-traditional machining methods with the help of diagrams. To describe various methods of protection of machined surfaces.
3. To describe hot working and cold working of metals & its applications with the help of diagrams.
4. To explain various methods of metal joining processes with the help of diagrams.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.5 YARN MANUFACTURING MACHINERY - III (TPE)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

- 1 To explain working principles and process parameters of combing preparatory, comber and ring frame.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber and ring frame.
- 3 Explanation to enumerate parameters influencing combing preparatory, comber and ring frame.
- 4 Describe utilities, maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber and ring frame and acquaint the students with industrial working by organizing industrial visits.

**1) Comber Preparatory:**

Requirements of good lap – importance of number of passages, importance of good lap, linear density of lap, etc. Methods of comber lap preparation – Different sequences of comber lap preparation, study of sliver lap machine, ribbon lap machine, unilap machine. Developments in combing preparatory machines. Maintenance & Assessment of combing preparatory machines.

**2) Combing Process And Constructional Details Of Comber:**

Objects of combing process. Study of combing cycle. Constructional details of Comber- feeding, nipper assembly, cylinder and detaching rollers, cylinder needles, web and sliver transport, drafting and coiling at comber. Semi combing, normal combing, super combing and double combing.

Forward and backward feed in combing. Maintenance of comber. Index Cycle, Comber Settings.

**3) Assessment Of Performance Of Comber –**

Norms for production, speed. Combing efficiency, Fractionating efficiency of comber. Influence of combing operation on quality.

**4) Automation Of Comber:**

Automatic and centralized noil collection. Automatic material handling. Stop motions in comber. Technical specifications of modern combers, available in the world market. Role of utilities in modern comber.

**5) Ring Spinning Process And Constructional Details Of Ring Frame:**

Objects and principle of operation, Creel, Drafting System, Top arm roller weighting, Spindle and driving arrangement, The thread guide devices, The balloon control ring and the separator and their function, importance design features and settings, Ring and Traveller, Study of building mechanism.

**6) Spinning Geometry And Yarn Tension:**

Importance, effect of spinning angle, Drafting angle, spinning triangle. Study of yarn tension variation and factors.

**7) Automation Of Ring Frame**

Monitoring of Ring frame Operation, Pneumafil and overhead cleaners, Auto doffing, Basics of Compact Spinning.

**8) Selection Of Specification, Defects And Remedies:**

Selection of specifications depending on count and material being processed. Defective production of ring frame and remedies. Routine maintenance schedule of ring frames Relative Humidification requirement and its importance.

**List of Experiments:-**

**Any twelve experiments in a term are to be conducted.**

1. Driving arrangement & calculations of Sliver lap machine.
2. Driving arrangement & calculations of Ribbon lap machine.
3. Study of roller settings in sliver lap and ribbon lap machines.
4. Study of constructional aspects, combing cycle & index chart of modern comber.
5. Driving arrangement & calculations in modern comber.
6. Study of Comber setting.
7. Driving arrangement & calculations related to production, constants, draft twist etc. of modern Ring frame.
8. Study of ring frame settings and spinning geometry.
9. Study of building mechanism of Ring frame.
10. Mill visit to study modern Comber, Ring frame.
11. Study of working principle, roller setting and lap forming in sliver lap machine.
12. Study of working principle, roller setting and lap forming in ribbon lap machine.
13. Study of performance assessment of comber.
14. Study of performance assessment of Ring frame.
15. Study of utilities on comber and ring frame.
16. Study of variable drives on ring frame.

**Reference Books:-**

1. The Textile Institute Publication –Manual of Textile Technology-Short Staple Spinning Series Vol I to V by W. Klein Vol III-A Practical training guide to Combing & Drawing by W.Klein
2. Practical guide to combing by W.Klein, Textile Institute publication Vol.3
3. Technology of cotton spinning by J.Janakiram.
4. Drawing, Combing and roving and speed frame by Zoltan, S.Szaloky, The Institute of Textile Technology, Virginia
5. Draw frame, combing and speed frame by J.H.Black; The Textile Institute publication, Manual of cotton spinning Vol-IV part II.
6. Spun Yarn Technology by Eric Oxtoby.
7. Elements of combing by A.R.Khare.

8. Cotton Drawing and Roving by G.R.Merril.
9. Manual of cotton spinning series, vol3, part 2 by J.Black et al Textile Institute Publication.

**Course Outcomes**

- 1 Students should be able to understand the working principles and process parameters of combing preparatory, comber and ring frame.
- 2 Understand the constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber and ring frame.
- 3 Students should estimate parameters related to combing preparatory, comber and ring frame.
- 4 Students should understand maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber and ring frame.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.6 FABRIC MANUFACTURING MACHINERY - III (TPE)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

- 1) To understand design features of automatic winding machine
- 2) To understand developments in warping process
- 3) To understand developments in sizing process
- 4) To understand design features of automatic weaving machine

**1) MODERN WINDING:-**

- a) Classification of automatic winding machine P & Q winding, their application.
- b) Technical requirements of winding process with respect to yarn take up, yarn tension and package requirements for warping, knitting & weaving
- c) Construction of automatic winding machines
  - i) Design features
  - ii) Drive to drums, scroll details, super drums, braking etc.
  - iii) Special features of different models.
- d) Yarn Clearing :-
  - i) Technical back ground
  - ii) Optimum clearing.
  - iii) Uster Classimat as an aid for yarn clearing.
- e) Electronic yarn clearers
  - i) Optical & capacitance.
  - ii) The capabilities of different yarn clearers.
  - iii) Knot factor.
- f) Splicing :-
  - i. Types - mechanical & pneumatic, details of construction, parameters, their applications.

- ii. Electronic checking of spliced joint.
- iii. Splice quality assessment (strength, appearance, hairiness)
- iv. Maintenance of splicers.

## 2) MODERN WARPING:-

- a) Constructional details & features of modern warping machines with reference to design of creel, pre-tensioners, automatic adjustment of central control of tensioners.
- b) Types of re creeling - magazine, truck, chain creels, semi - auto & auto creels, creel - master, and auto plan for colour patterns.
- c) Head Stock - i) Beam warping - Auto leasing, drive, brakes and automatic doffing & donning.  
ii) Sectional warping - Auto leasing, drum traverse & cone angle adjustment, beam traverse & its adjustment.

## 3) MODERN SIZING:-

Study of modern sizing machine elements.

- 1) Creel - construction, braking arrangement & positive drive.
- 2) Size Box – design of various modern boxes.
- 3) Drying Cylinders - Heating arrangement, coating ,temperature & its control, pressure of steam, thermal performance of drying cylinders, steam traps
- 4) Head Stock - Dry splitting, measuring motion, drag roller, comb & drive to weavers beam, pressuring device.
- 5) Control Systems- Modern sizing machine drive for moisture, temperature, size level and stretch.
- 6) Factors affecting size pick up & size add-on, migration.
- 7) Assessment of sizing performance - laboratory & practical methods.
- 8) Concept of single end sizing & various methods.
- 9) Concept of dyeing cum sizing.
- 10) Automation and MIS on modern machines.
- 11) Concept of recycling of sizes.
- 12) Calculations - Related to size concentration, size pick up, stretch, drying, count of warp production etc.

**4) AUTOMATIC WEAVING:-**

- a) Limitations of ordinary looms: - Production, efficiency, quality & allocation, objectives for developing automatic looms, scope for automation.
- b) Design features of automatic looms: - Drives, loom motions, accessories & other critical features of automatic looms.
- c) Weft feelers: - Construction working of mechanical type side sweep, electrical & electronic weft feelers, their merits, demerits & applications.
- d) Transfer mechanisms: - transfer motion's working & construction, shuttle protector, temple & shuttle eye cutter. Requirement for successful transfer of pirn, reasons of stripping, bottoms & remedies. Shuttle changing mechanism & safety motion, its applications.
- e) Automatic let-off motion: - Principles and requirements of automatic let-off mechanism, types, construction & working of semi automatic type let-off motions.
- f) Warp stop motion: - Types, Construction and working of mechanical and electrical warp stop motion, Types of drop pins, specifications & applications.
- g) Centre weft fork: - Construction & working type center weft fork motion & its advantages.

**List of Experiments:-**

- 1) Study of features of Automatic winding machine.
- 2) Study of Automatic weft winding machine. - Spindle speed, traverse speed, coils per double traverse, diameter control, production and efficiency.
- 3) Study of shuttle change motion and silk loom features.
- 4) Visit to Automatic winding machine unit.
- 5) Dismantling and resetting of under pick motion.
- 6) Dismantling and resetting of Cimmco & Ruti-C weft feeler motion.
- 7) Dismantling and resetting of Cimmco auto let-off motion.
- 8) Dismantling and resetting of pirn change motion.
- 9) Dismantling and resetting of clutch motion.
- 10) Study of Ruti-C loom -drive, centre weft fork, pick finding, take-up drive, back rest, multi pawl drive, shuttle construction, picking, loose reed and cam shedding.
- 11) Study and setting of warp stop motions



- 12) Visit to Automatic loom unit.
- 13) Study of sectional warping machine drive for warping speed, beaming speed, reed & beam traverse speed, production and efficiency.
- 14) Visit to modern warping and sizing machine unit.
- 15) Fabric analysis
- 16) Loom operating - starting, stopping, knotting, & drawing -in & study of fabric defects.

**Reference Books:-**

1. Principles of Weaving by Marks A.T.C. & Robinson.
2. Weaving Machines, Materials & Methods by Prof. M.K. Talukdar, Prof.D.B. Ajgaonkar etc.
3. Textile Mathematics - Vol.-I & II by J.E. Booth.
4. Modern Preparation & Weaving Machines by A. Ormerod.
5. The Technology of Warp Sizing by J.B. Smith.
6. Sizing by Sydel.

**Course Outcomes**

- 1 Understand design features of automatic winding machine
- 2 Understand developments in warping process
- 3 Understand developments in sizing process
- 4 Understand design features of automatic weaving machine

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.7 TEXTILE MACHINE DRAWING (TPE)**

Practical	:	2 Hours / Week
Term Work	:	50 Marks
Subject Total	:	50 Marks

**Course Objectives**

1. To explain IS conventions for machine drawing and symbols used in various branches of Engineering.
  2. To describe method to prepare free hand sketches, details and assembly drawings of machines.
  3. To illustrate free hand sketches, assembly and details drawings of textile machines.
  4. To explain use of CAD for machine drawing.
- 
- 1) Study of IS conventions essential for machine drawing.
  - 2) Study of electrical, electronic , hydraulic and pneumatic symbols used.
  - 3) Drawing sketches of couplings, cotter joint, knuckle joint, pipe joint, bearings, springs, pulleys, gears and gear drives.
  - 4) Free hand sketches of
    - a) Primary loom motions
    - b) Gearing plan of spinning machines
    - c) Differential gearing
    - d) Comber index chart
    - e) Detaching roller mechanism
    - f) Drafting system of draw frame
    - g) Coiler drive
  - 5) Details and assembly drawings of machines / mechanisms assemblies containing 6-8 components.
  - 6) Computer aided drafting used for layout of industrial units.

**TERM WORK**

Seven or Eight submission sheets are to be drawn based on above syllabus. Every year two different drawings may be given to students to avoid repeatability.

- 1) One sheet on IS conventions.
- 2) One sheet on free hand sketches of textile mechanism.
- 3) One sheet based on weaving cam design.

- 4) Assembly & details drawing of flanged coupling, bearings, joints( knuckle or cotter joints), pulleys, springs, or gears consisting of 6-8 components.
- 5) Assembly and details drawing of following  
Single plate clutch, tailstock, feed chuck valve, etc.
- 6) Assembly and details of textile mechanism  
Picking shaft assembly, feed roller of carding machine, lap roller drive at comber.
- 7) Sheet representing hydraulic, pneumatic, Electrical, Electronic symbols and circuits, pipe joints.
- 8) Sheet on machinery and plant layout with help of computer drafting.

**Reference Books:-**

1. M/c Drawing : N.D. Bhatt
2. M/c Drawing : N. Sidheshwar
3. M/c Drawing : V.V. Shastri & P.P. Kanhaiya
4. M/c Drawing : M.B. Shah
5. Hand Book : IS 696, IS 969.
6. Elements of w/s Technology : Hazra Choudhary
7. Machine manuals of textile machines.

**Course Outcomes**

Students will be able to

1. Know and draw IS conventions for machine drawing and symbols used in Electrical, Electronics Engg. And hydraulics, pneumatics.
2. Prepare free hand sketches of machine parts and assemblies of textile machines.
3. Make assembly and details drawings of textile machines and machines in mechanical engineering.
4. Use of CAD for machine drawing and layout.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.4 CHEMISTRY OF TEXTILE FIBRES - II (TC)**

Lectures	:	4 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam	:	50 Marks
Subject Total	:	175 Marks

**Course Objectives:**

1. To describe the basic concepts of various spinning technologies and fibre manufacturing processes.
2. To impart knowledge about the chemistry & chemical composition of synthetic fibres
3. To give details about the physical and chemical properties of fibres and use knowledge of fibres properties in wet processing of textiles
4. To describe the concept of modification of fibres and to give examples of various application of fibres

**1. Fundamentals of Fibre Spinning:-**

General principles of the spinning process, Theory of solidification of polymer in various spinning techniques. Rheology of spinning, Spinnability of fluid, Concept of melt spinning, General features and essential requirements of melt spinning. Total sequence of polymer flow in melt spinning, Melt spinning process - melting devices, static device, filters, manifold, spin pack, quenching system, Take-up winders. Variables in melt spinning, Formation of fibre structure during spinning, Concept of high speed spinning. Concept of LOY, MOY, POY, HOY, FOY yarns, Spin draw process, Concept of Direct melt spinning, Concept of micro fibres and nano fibres.

**2. Polyester Fibre:-**

Synthesis of Raw materials, manufacturing process, physical and chemical properties and end uses of polyester. Recent developments of polyester fibre - hollow fibre, hydrophilic fibre, low pilling, flame retardant fibre, CDPET,

biodegradable polyester, polyester fibres other than polyethylene terephthalate (Polypropylene terephthalate (PPT), Polybutylene terephthalate (PBT).)

### **3. Polyamide Fibre:-**

Synthesis of Raw materials, manufacturing process, physical and chemical properties and end uses of Nylon-6 & Nylon-66. Recent developments of nylon fibre - hydrophilic, antistatic, low pilling, flame retardant, differentially dyeable nylon.

### **4. Acrylic Fibre : –**

Synthesis of Raw materials, manufacturing process, physical and chemical properties and end uses of acrylic and modacrylics. Recent developments of acrylic fibre hydrophilic fibre, low pilling, flame retardant, differentially dyeable, high shrinkage fibre.

### **5. Polyolefin Fibre:-**

Raw materials, manufacturing process, physical and chemical properties of polypropylene and polyethylene, various applications of Polyolefin fibre.

### **6. Bicomponent Fibre :-**

Introduction, methods of production, Concept of Side-by-Side, Sheath and Core, Islands-in-the-Sea and Segmented-pie cross-section. Properties and uses.

### **7. Optical Fibre :-**

Introduction, raw materials, manufacture, physical and chemical properties and end uses.

### **List of Experiments:-**

1. Identification of individual fibres by chemical method.
2. Identification of fibres from binary blend by chemical method - I.
3. Identification of fibres from binary blend by chemical method - II.
4. Quantitative analysis of given known blend – I.
5. Quantitative analysis of given known blend – II.
6. Quantitative analysis of given known blend – III.
7. Determination of accessible region of cotton.

8. Determination of accessible region of polyester by Iodine absorption method.
9. Demonstration of laboratory melt spinning unit and production of filament yarn.
10. Demonstration of laboratory filament yarn drawing machine and drawing & heat setting of polyester POY.
11. Detection of fibre damage.
12. Identification of fibres by microscopic method.
13. Determination of density of fibre.
14. Determination of  $\overline{M}_n$  Nylon by End Group Analysis.
15. Determination of  $\overline{M}_n$  of PET by End Group Analysis.
16. Identification of fibres from tertiary blends by chemical methods.

**Reference Books:-**

1. Manufactured Fibre Technology by Dr.V.C. Gupta & Dr.V.K. Kothari.
2. Science and technology of Man Made Fibres by Dr. S. P. Mishra
3. Manmade fibres by R.W. Moncrieff.
4. Production of Synthetic fibres by Dr. A. A. Vaidya.
5. Synthetic Fibres by Jordon Cook.
6. Handbook of Fibre Science and Technology – Vol.I, II & III by Menachem Lewin & Stephen B. Sello.
7. High Tech Fibrous Materials by Tyrone L. Vigo and Albin F. Turbak.
8. Fundamentals of high speed spinning by A. Ziabicki

**Term Work:**

Term work will be assessed on the basis of performance of student in the practical.

**Course Outcome**

1. Understand the basic concepts of various spinning technologies and fibre manufacturing processes.
2. Illustrate the chemistry & chemical composition of synthetic fibres
3. Enunciate the physical and chemical properties of fibres and use knowledge of fibres properties in wet processing of textiles
4. Understand various modifications of fibres and applications of fibres

## **SECOND YEAR B. TEXT. – SEMESTER – I**

### **3.5 SPINNING TECHNOLOGY (TC)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

### **Course Objectives**

1. To explain cotton cultivation, ginning and yarn numbering systems.
2. To explain process flow charts of different yarns and its preparatory processes.
3. To discuss the ring spinning and yarn doubling.
4. To describe principles and manufacturing processes of unconventional yarns.

### **1. Cotton Fibre Cultivation & Ginning:-**

- Cotton cultivation in India.
- Definition of picking and types of picking, their effect on cotton quality
- Definition of Ginning and types of Ginning.

### **2. Yarns Numbering System:-**

- Introduction to Direct system, indirect system.
- Study of Tex, Denier, English, Metric, Worsted, Woolen etc. systems.
- Conversions between different systems of yarn numbering.
- Study of folded yarn, resultant yarn count calculations.

### **3. Process flow charts:-**

Conversion of staple fibres into Carded / Combed / Rotor / Air-jet yarn

4. **Mixing & Blow-room** – Objects of mixing and blow-room. Importance of opening & cleaning. Sequence of blow-room machines used. Material feed to the card (Lap feed / Chute feed System).

5. **Carding** – Objects of carding, Study of card, Introduction to carding and stripping action. Passage of material through carding. Production Calculation.
6. **Draw frame** – Concept of drafting, requirement of doubling, objects of draw frame. Working of Draw frame. Calculations.
7. **Comber Preparatory and Comber** – Objects of comber preparatory, Machines used. Passage of material through Sliver lap and Ribbon lap machines.
  - Objects of comber, working of comber and passage of material through comber. Production Calculations.
8. **Speed frame** – Object of speed frame. Passage of material through speed frame. Production Calculations.
9. **Spinning**
  - a. **Ring Frame** – Objectives of ring frame, Passage of material through ring frame, Ring yarn properties, Production Calculations.
  - b. **Yarn Doubling** – Objects, Passage of material through yarn doubling machine.

#### 10. Unconventional Spinning Systems:-

Advantages and limitations of ring spinning system

Introduction to following unconventional spinning techniques.

- a. Compact spinning system.
- b. Rotor spinning system.
- c. Air Jet spinning system.

Properties of yarns produced on above systems.

#### List of Experiments:-

1. To draw process flow chart for carded yarn, combed yarn & rotor yarn.(Mill Visit)
2. Study of hank and count calculation by wrapping method
3. Sequence of machines in blow-room
4. Passage of material through bale opener, mild cleaner.
5. Study of intensive opener and Chute feed system.
6. Study of passage of material and production calculation of carding machine.



7. Study of passage of material and production calculation of draw frame machine.
8. Study of passage of material through comber preparatory machine.
9. Study of passage of material and production calculation of comber.
10. Study of passage of material and production calculation of speed frame machine.
11. Study of passage of material and production calculation of ring frame machine.
12. Study of ring Doubler and TFO.
13. Study of Ring / Compact yarn manufacturing.
14. Study of passage of material and production calculation of rotor spinning machine.
15. Study of passage of material and production calculation of Air jet spinning machine.
16. Study of passage of material through soft winding machine.

**Reference Books:-**

1. The technology of short staple spinning by W. Klein, Vol. I, II, III, IV and V.
2. Cotton Ginning, Textile Progress, The Textile Institute Publication.
3. Carding and Drawing by Prof. A. R. Khare.
4. Ring spinning and doubling by A. R. Khare.
5. Cotton Carding by G.R. Merrill.
6. Two-for-One Technology and Technique for Spun Yarn by Dr. H. S. Kulkarni and Dr. H. V. S. Murthy.
7. Cotton Spinning By Ganesh and Garde
8. Spun Yarn Technology by Oxtoby

**Course Outcome**

Student will be able to,

1. Understand the cotton cultivation, ginning and yarn numbering systems
2. Understand the process flow charts of different yarns and its preparatory
3. Understand the ring spinning and yarn doubling process.
4. Illustrate the principles and manufacturing processes of unconventional yarns.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.6 TECHNOLOGY OF PRETREATMENTS - I (TC)**

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam	:	50 Marks
Subject Total	:	175 Marks

**Course Objectives:**

1. To describe the importance of sizing and functions of various ingredients and their formulations to avoid end breakages
2. To explain the significance of various process sequence for various fibers and general processing route to be opted
3. To discuss various chemical processing steps like desizing, scouring, bleaching and mercerizing with reference to various substrate
4. To discuss the various processing bleaching and mercersing machinery and techniques of batch and continuous method of pretreatment

**CHAPTER – 1 SIZING**

Importance and objects of sizing, Sizing ingredients & their functions. Adhesives and their classification. Introduction to natural, modified and synthetic adhesives. Importance of various properties like viscosity, keeping and congealing. Size paste formulations for various types of yarns like cotton, blends and synthetics in different counts. Concept of size pick up, % add on, it's importance in weaving. Tests for size identification.

**CHAPTER – 2 GREY INSPECTION**

Yarn and fabric faults, types of faults, Introduction & importance of pretreatments, Classification of impurities, Various pretreatment sequences for yarn, woven, knits, cotton, synthetics & their blends, wool and silk. Importance of grey inspection, Four point & ten point system, Numericals for acceptance & rejection of grey fabrics. Inspection machines for woven and knit goods.

### **CHAPTER –3 MECHANICAL CLEANING PROCESSES**

Objects of shearing & cropping process, working principle and features of shearing & cropping machine, Objects of singeing, Methods of singeing, Details of gas singeing m/c Singeing of yarn, woven, knit, synthetic & blended fabrics, Evaluation of the efficiency of singeing.

### **CHAPTER – 4 DESIZING**

Objects of desizing, Mechanism of desizing, Classification and types of desizing, various practical methods of desizing. Evaluation of the efficiency of desizing like Tegewa test.

### **CHAPTER – 5 SCOURING**

Objects of scouring, various processes occurring during scouring for removal of impurities. Recipe and functions of scouring bath ingredients. Solvent and solvent assisted scouring. Evaluation of the efficiency of scouring.

### **CHAPTER – 6 BLEACHING**

Objects, mechanism of bleaching, Chemistry of natural coloring matter and their removal, Bleaching with hypochlorite, Concept of A.O.X , Chemistry of bleaching agents like Hydrogen Peroxide, Per-acetic acid, Bleaching of Cotton, blends and Polyester fabrics, Evaluation of the efficiency of bleaching.

### **CHAPTER – 7 COMBINED PROCESSES & METHODS**

Concept of single step preparatory processes, Batch wise, semi-continuous & continuous method of bleaching machines like Jiggers, winch, soft flow, pad steam and continuous bleaching range.

### **CHAPTER – 8 INTRODUCTION TO MERCERIZATION**

Objects of Mercerization, Various changes brought about by mercerization, Various factors affecting the process of mercerization.

**List of Experiments:-**

- 1) Sizing of 100% cotton yarn of different counts & testing of sized yarn.
- 2) Testing of adhesives used in sizing.
- 3) Testing of softeners used in sizing.
- 4) Desizing of Cotton by batch method & evaluation of desizing efficiency by TEGEWA scale.
- 5) Desizing of Cotton by pad steam method & evaluation of desizing efficiency by TEGEWA scale.
- 6) Alkaline scouring of Cotton fabric with batch wise & Pad- Steam method.
- 7) Solvent assisted scouring of Cotton fabric.
- 8) Bleaching of Cotton fabric using Sodium Hypochlorite.
- 9) Bleaching of Cotton fabric using Hydrogen Peroxide by batch method & OBA treatment .
- 10) Bleaching of Cotton fabric using Hydrogen Peroxide by Pad – Steam method.
- 11) Determination of Whiteness index of grey, bleached and OBA treated fabric samples using CCM system.
- 12) Determination of Absorbency & Ash-Content.
- 13) Determination of Copper number.
- 14) Determination of Carboxyl group content.
- 15) Mercerization of cotton yarn with different counts.
- 16) Visit to conventional process house.  
(Study of machinery, process sequences & consumption of various utilities.)

**Reference Books:-**

1. Sizing by Prof. D. B. Ajgaonkar, Dr. M. K. Talukdar & V.R. Wadekar.
2. Chemical technology of fibrous materials by F. Sadov.
3. Chemical Processing of Polyester / Cellulosic blends by R.M.Mittal & S.S. Trivedi.
4. Technology of Mercerizing by J.T. Marsh.
5. Bleaching, Dyeing & Chemical Technology of Textile Fibres by E.R. Trotman.
6. Technology of Bleaching by Dr. V.A. Shenai.
7. Warp Sizing by Paul V. Seydel.
8. Bleaching & Mercerizing – BTRA Silver Jubilee Monograph series.

**Course Outcomes:**

- 1 Design sizing recipe for various yarn counts and fibres.
- 2 Formulate suitable recipe for pretreatments of various fibre and fabrics.
- 3 Identify the pretreatment faults and recommended remedial measures.
- 4 Illustrate with line diagram, working principles of the various machines used for mechanical cleaning & batch wise and continuous method of pretreatments.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.7 PRINTED TEXTILE DESIGN AND COLOUR (TC)**

Practical	:	2 Hours / Week
Term Work	:	50 Marks
Subject Total	:	50 Marks

**Course Objectives**

1. To describe various elements of textile design development, color modification and color theory charts.
  2. To demonstrate textile design development with the help of designing principles.
  3. To describe the production of textile design with different bases.
  4. To explain textile design printing on fabric.
- 
1. Elements of art- Line, Direction, Size, Shape, Colour, Value, Texture.
  2. Colour modification chart- Primary, Secondary and Tertiary colour modification.
  3. Colour theory chart - Pigment theory of colour(Subtractive)and light theory of colour(Additive).
  4. Textile design development with the help of designing principles - Principle of Repetitions, Principle of Alteration (Change in colour, Change in size, Change in direction, Permutation and combination), Grade, Harmony, Balance, Contrast, Dominance.
  5. Composition of all over textile design by following bases- Rectangle base, Drop base – half drop, full drop, Diamond base, Ogee base, Sateen base.
  6. Development of textile design for screen printing.
  7. Use of different tools for design development in printing.
  8. Image development and colour processing for textile printing.

**Reference Books:-**

1. "Textile design and colour- Elementary weaves and figured fabrics", - William Watson.
2. "Fabric structure and design"- N. Gokarneshan.
3. "Woven Structures and Design" -Doris Goerner.
4. "Handbook of textile design- principles, processes and practice" - Jacquie Wilson, TheTextle Institute, Woodhead Publishing Limited.
5. "Encyclopedia of clothing and fashion- vol-1,vol-2,vol-3" - ChristoferBreward, Charles scribner sons.

**Course Outcome**

Student will be able to,

1. Understand various elements of textile design development, color modification and color theory charts.
2. Create textile design development with the help of designing principles.
3. Draw textile designs with different base.
4. Develop textile design printing on fabric

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.1 BASICS OF ELECTRONICS (FT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam	:	50 Marks
Subject Total	:	175 Marks

**Course Objectives:**

1. To classify electronic components and calculate values of passive components
2. To explain the operation and applications of semiconductor devices, electromechanical devices.
3. To understand working principle of different types of sensors and transducers.
4. To demonstrate applications of sensors and transducers in textiles.

**1) Electronics Components**

Electronics components, passive components, resistors, color coding of resistors, Variable resistors, capacitors and inductors

**2) Semiconductors**

Classification of materials- metals, insulators and semiconductors, intrinsic semiconductor, extrinsic semiconductors, p-n junction diode, junction theory, VI characteristics of p-n junction diode, use of diode in rectifiers, half wave rectifier, full wave rectifiers, performance of rectifiers, filters-shunt capacitor filter, series inductor filter, zener diode, zener regulator, diode specification.

**3) Transistor**

Construction, working of transistor, transistor configurations, common emitter characteristics, transistor amplifying action, Basic CE amplifier



#### **4) Op-Amp**

Introduction, block diagram, symbol, ideal op-amp, open loop op-amp configuration, Concept of feedback in amplifier, +ve and –ve feedback, op-amp with negative feedback, IC741-pinout and specifications

#### **5) Power Semiconductor Devices and Applications**

SCR construction, operation, turning ON and OFF of SCR, SCR characteristics, Triac- Construction, working and characteristics, diac- Construction, working and characteristics, UJT -Construction, working and characteristics. UJT as Relaxation Oscillator, SCR in DC Motor speed control, AC power control using triac, power MOSFET, IGBT, power modules

#### **6) Optoelectronic Devices**

Classification of optoelectronic devices- emitters, sensors, optocouplers; photodiode, phototransistor, LDR, photo voltaic cell, LED, optocouplers, optical shaft encoders, application of optoelectronic devices in textile

#### **7) Transducers**

Introduction, transducer classification – Primary and secondary transducers, active and passive transducers, analog and digital transducers, basic requirements of transducers, Pressure measurement –bourdon tubes, bellows and diaphragms; Temperature Transducers – RTD, Thermocouple, Thermistors; Strain gauge-working principle, types; Linear variable differential transformers (LVDT), Capacitive transducers, Piezo electric transducers, proximity sensors

Note: Emphasis should be given on applications of above transducers in textiles

#### **8) Electromechanical Devices**

Electromagnetic relay, solenoids, solenoid valve, limit switches, electromagnetic clutches and breaks

#### **List of Experiments:-**

1. Forward and reverse bias characteristics of diode.
2. Half wave rectifier (with and without filter).
3. Center tap full wave rectifier (with and without filter).

4. Bridge rectifier (with and without filter).
5. Reverse characteristics of zener diode.
6. I/O characteristics of transistor in CE configuration
7. Op-amp inverting and non-inverting amplifier.
8. UJT characteristics
9. SCR characteristics
10. AC power control using triac.
11. LDR characteristics.
12. Speed measurement using optical and magnetic pickups.
13. RTD characteristics
14. Temperature measurement using thermister
15. Weight measurement using strain gauge.
16. Displacement measurement using LVDT

**Reference Books:-**

1. Electronics Components and Materials by Madhuri Joshi
2. A Textbook of Applied Electronics by R. S. Sedha
3. Basic Electronics by B. L. Therja
4. Electrical and Electronics Measurements and Instrumentation by A.K.Sawhey, Dhanpat Ria and Sons Pub.
5. Instrumentation Devices and Systems by C.S. Rangan, G.R. Sharma, TMH Pub
6. Op-amp and Linear Integrated Circuits by Ramakant Gaykwad

**Course Outcomes:**

Student will be able to,

- 1 Classify electronic components and calculate values of passive components
- 2 Explain the operation and applications of semiconductor devices, electromechanical devices.
- 3 Understand working principle of different types of sensors and transducers.
- 4 Demonstrate application of sensors and transducers in textiles.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.3 FABRIC STRUCTURE AND DESIGN (FT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives:**

1. Explain construction and application of various compound fabrics.
2. Explain color and weave effect.
3. Discuss concepts of Fabric Engineering.
4. Explain application of CAD in developing fabric structures.

1) Bedford cords: plain faced - twill faced. Wadded - modifications. Welt piques: wadded piques - Loose back and fast back welts and piques, wadded pique. Simple spot designs, Methods of drafting spot figures, Distribution of spot figures, Calculations relating to spot figure designing.

2) Simple color and weave effects: General considerations, representation of color and weave effect, Classification, Examples of simple colour and weave effects, Stripe & check weave combination: forms of stripes and checks, selection of weaves, classification, Oxford shirting cloth, Harward shirting cloth.

3) Extra warp and extra weft figuring. Extra warp and extra weft figuring with two colors.

4) Backed Fabrics: Warp and Weft back, wadded backed fabric.

5) Warp pile produced by - terry weaves, Face to face weaving, wire insertion methods, carpet structure. Weft pile: plain back - twill back velveteen, corduroy, Weft plush, Length, density and fastness of pile.

6) Double cloth: Object, Classification: - self stitched - face to back - back to face - Combination face to back and back to face stitched double cloth. Wadded double cloth - weft and warp Wadded double cloth - Center Warp & Weft Stitched double cloth. Interchanging double cloths, multilayer fabrics, open to double & triple width & tubular fabrics.

7) Gauze & Leno: Principles, basic sheds, leno with flat steel doups And slotted doups, point draft or counter leno, simultaneous top & bottom douping, application of slotted doups, easing and shaker motion concept, working and construction.

8) Fabric engineering: fabric classification as per structure pierces formula for yarn diameter, cloth cover, cloth geometry of plain & twill fabrics, practical application of cloth geometry and cover factor.

9) Construction and development of jacquard design.

Jacquard sizes, harness and design calculation, casting out, size of repeat, count of design paper. Development of jacquard design -construction of square paper designs, process of drafting a sketch design, drafting designs from woven fabrics,

10) Application of CAD in developing fabric structure and design.

**List of Experiments:**

- 1) Fabric analysis: Bedford cords.
- 2) Fabric analysis: Extra warp
- 3) Fabric analysis: Extra weft
- 4) Fabric analysis: Stripe weave.
- 5) Fabric analysis: Check weave.
- 6) Fabric analysis: Pile fabrics
- 7) Fabric analysis: double cloth
- 8) Fabric analysis: Leno fabric.
- 9) Sample weaving of weft backed cloth
- 10) Sample weaving of Bedford cloth
- 11) Sample weaving of extra weft
- 12) Sample weaving of double cloth

- 13) Sample weaving of terry pile fabric
- 14) Sample weaving of Bedford cloth
- 15) Sample weaving of stripe & check fabric.
- 16) Development of jacquard design.

**Reference Books:-**

1. Grosicki Z., "Watson's Textile Design & Color: Elementary weaves & Figure", Blackwell Science, Commerce place.
2. Grosicki Z., "Advanced Textile Design & Colour:", Blackwell Science, Commerce place.
3. H.Nisbet, "Grammar of textile Design", Tarporevala sons &Co. Pvt. Ltd.,
4. W.S. Murphy, "Textile weaving & Design", Abhishek Publications.
5. Marks & robinson, " woven cloth construction"
6. J.E. Booth," Textile mathematics- vol-I &II"

**Course Outcomes:**

1. Analyze and construct compound fabrics.
2. Demonstrate color and weave effect.
3. Understand concepts of Fabric Engineering.
4. Apply CAD in developing fabric structures.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.4 TESTING OF FIBRES AND YARNS (FT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

**Course Objectives**

1. To discuss technical significance of fibre and yarn properties.
2. To discuss the factors affecting fibre and yarn properties.
3. To explain principle and testing methodology of fibre properties.
4. To explain principle and testing methodology of yarn properties.

**A. FIBRE TESTING:-**

**1. Fibre Properties**

**a) Longitudinal dimensions (Fibre Length):-** Concept, Technical significance of fibre length, Fibre length measurement – Oil plate method, Comb sorter method, Digital Fibrograph.

**b) Transverse Dimensions (Fineness & Maturity):-**

**i. Fineness** –Concept, Technical significance of fibre fineness, Measures of fibre fineness, Measurement of fineness –Gravimetric method, Airflow method

**ii. Maturity of cotton**–Concept, Technical significance, Measures of maturity, Measurement of maturity – Caustic soda method

**2. Modern Fibre Testing Instruments:** - High Volume Instrument& Advanced Fibre Information System.

**3. Neps:** - Definition, Importance, Testing of neps on AFIS.

## B. Yarn Properties

1. **Linear density of yarn:** - Concept, Count or Yarn number, Direct & indirect system of yarn numbering, Measurement of yarn number: Electronic weighing balance, Beesley balance.
2. **Twist & Twist Measurement:**-Concept, Terms and Definitions, Effect of twist on yarn and fabric properties, Measurement of twist – Untwist and twist method, Twist take-up method.
3. **Evenness of Yarn:-** Concept, Causes of unevenness, Classification of variations, Effects of unevenness, Measures of irregularity: PMD, CV, Measurement of unevenness – Visual examination, Capacitance principle, Imperfections, Classimat faults,
4. **Hairiness in spun yarn:** - Causes, Effects, Measurement of yarn hairiness- Photoelectric method

## C. Tensile properties of fibres and yarns

Importance, Terms and definitions, Stress-strain curve & its importance, Factors influencing tensile strength of textiles, Types of loading, Principles of tensile testing machines – Pendulum level principle, Strain gauge principle

**Fibre Strength:** - Measurement of fibre strength: Single fibre strength – Instron, Bundle strength – Stelometer.

**Yarn Strength:-** - Single yarn Strength, Lea Strength,

### List of Experiments:-

1. Fibre length measurement by Comb sorter method.
2. Fibre length measurement by grease plate method.
3. Fibre maturity measurement by caustic soda.
4. Measurement of fibre fineness by airflow instrument.
5. Measurement of fibre fineness by gravimetric principle.
6. Determination of fibre bundle strength by Stelometer.

7. Determination of fibre parameters by HVI.
8. Determination of fibre parameters by AFIS.
9. Determination of yarn number.
10. Determination of twist in single yarn.
11. Determination of twist in double yarn.
12. Determination of single thread strength.
13. Determination of lea strength.
14. Determination of yarn evenness by capacitance principle.
15. Determination of yarn evenness by visual examination.
16. Determination of yarn hairiness by photoelectric method.

**Reference Books:-**

1. Principles of Textile Testing, J.E.Booth, CBS Publishers & Distributors, 1996.
2. Physical Properties of Textile Fibres, Morton &Hearle.
3. Physical Testing of Textiles, B. P. Saville.
4. Textile Testing- Fibre, Yarn and Fabric, Arindam Basu, Published by SITRA, Coimbatore.

**Course Outcomes**

Student will be able to

1. Understand technical significance of fibre and yarn properties.
2. Discuss factors affecting fibre and yarn properties.
3. Test and interpret results obtained for fibre properties.
4. Test and interpret the results obtained for yarn properties.



**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.5 TEXTILE MANUFACTURE (FT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course objective:**

1. To explain fibre preparation and spinning preparatory process and calculations.
2. To describe yarn spinning process and calculations.
3. To explain weaving preparatory processes and calculations.
4. To describe automatic weaving, shuttleless weaving and non-woven fabric manufacturing.

**Unit-1: Fibre preparation –**

**Blowroom:** Types and composition of trash in cotton, Objects of blowroom  
Elements of blow room machines. Working of machines used in blowroom.

**Card:** Objects, basic actions in card, construction and working of card,

**Unit-2: Spinning preparatory-**

**Draw frame:** Objects, Concepts of drafting & doubling, Working of draw frame.

**Comber preparatory and comber:** Objects, Characteristics of good lap,  
Machine sequences and working of machines used for comber preparatory,  
Constructional details and working of comber.

**Speed Frame:** Objects, constructional details and working of speed frame.

**Unit-3: Spinning -**

**Ring Frame:** Objects, drafting, twisting & winding, constructional details and  
working of ring frame.

**Unit-4: Spinning calculations-**

Cleaning efficiency%, production calculation on card, draw frame, comber, speed  
frame and ring frame.

### **Unit-5: Weaving preparatory -**

**Winding:** Constructional details and features of modern winding machine.

**Warping:** Classification, Features of modern warping machine.

**Sizing:** Features of modern sizing machine.

### **Unit-6: Weaving**

**Automatic Weaving:** Limitations of ordinary looms, types of Auto looms, applications of auto looms, fabric defects and remedies.

**Shuttleless Weaving:** Classification, Weft insertion principle of Projectile, applications, selvedge weave, Principle of rapier weft insertion through various mechanisms such as single rapier, double rapier, rigid and flexible, biphasic & twin rapier. Selvedge formation, Multicolour feeding mechanism, Field of application. Fabric defects and remedies.

### **Unit-7: Non Woven Fabrics**

Types, different method of production of non woven such as needle punched, chemical & thermal bonded, applications of non woven fabrics.

### **List of Experiments:**

1. Study of constructional details of blowroom bale opening and course cleaning machines.
2. Study of constructional details of blowroom fine/intensive cleaning machines and chute feed system.
3. Study of constructional details of card and draw frame.
4. Study of constructional details of comber preparatory machines.
5. Study of constructional details of comber.
6. Study of constructional details of speed frame and ring frame.
7. Spinning of carded and combed yarn.
8. Comparison of carded and combed yarn.
9. Study of modern automatic winding machine.
10. General study of projectile weaving machine.
11. General study of flexible rapier weaving machine.
12. General study of rigid rapier weaving machine.

13. General study of cop changing automatic loom.
14. General study of shuttle changing automatic loom.
15. General study of dobby, drop box and jacquard.
16. Visit to modern warping and sizing unit.

**Reference books:**

1. 'The Technology of Short Staple Spinning' Vol I to IV by W.Klein
2. Blowroom Carding, Drawframe by Prof. A.R. Khare.
3. Ring frame & doubling by Prof. A. R. Khare.
4. 'Opening Cleaning and Picking' by Dr.Zoltan S. Szaloki
5. Essential Calculations of Practical Cotton Spinning by T.K. Pattabhiraman.
6. Principle of weaving by Marks A. T. C. & Robinson
7. Modern Preparation & weaving Machines by A. Ormerod.
8. Non-wovens by N. N. Bannerjee
9. Manual of Non-wovens by Dr. Radko Kríma
- 10 Shuttleless weaving by Svaty

**Course Outcome:**

Students will able to-

1. Illustrate fibre preparation and spinning preparatory process and calculations.
2. Understand yarn spinning process and calculations
3. Understand weaving preparatory processes and calculations.
4. Understand automatic weaving, shuttleless weaving and non-woven fabric manufacturing.

**SECOND YEAR B. TEXT. – SEMESTER – I**

**3.6 PATTERN ENGINEERING - I (FT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam	:	50 Marks
Subject Total	:	175 Marks

**Course Objectives**

1. To understand fundamentals of basic pattern making.
2. To explain procedure for designing with darts.
3. To develop the patterns for garment components.
4. To describe different types of garment closures..

**1) BASIC PATTERN MAKING:**

Patternmaking Essentials for the Workroom, Form Measurements and Figure Analysis Function of Pattern Making Tools, Pattern Making Terms, Model form and measurements, Measurement Taking – Size chart and Measuring of Sizes.

**2) DRAFTING OF BASIC PATTERN SET:**

Basic dress foundation, front and back bodice block, front and back skirt and sleeve, testing of fitting of basic blocks & correction.

**3) DART MANIPULATION:**

Introduction to darts and flat pattern making, Techniques of dart manipulation, Pivotal method & Slash & Spread method, Dart terminology, creating styles through dart manipulation.

**4) DESIGNING WITH DARTS:**

Introduction, Tuck darts, pleats, flares, gathers fullness, Dart clusters & dart equivalents, multiple darts. Importance of drill hole marks in the darts.

### 5) DRAFTING OF SLEEVE & COLLAR:

**Sleeves:** Introduction, sleeve terminologies, dartless sleeve pattern, adaptations for various types.

**Collars:** Introduction, collar terms, collar classification, basic shirt collar foundation, collar variations.

### 6) DRAFTING OF YOKES & PLACKETS:

**Yokes:** Yokes for bodice, gathers, yokes design variations, gathers, flanges, pleat tucks & pin tucks.

**Plackets:** Pointed placket with facing-in-one, wing collar placket, slit opening with placket.

### 7) POCKETS:

Pocket classification, outside pockets, seam pocket, jeans pocket, accordion pockets, stylized outside pockets, pocket with hidden side seam.

### 8) Introduction and Construction Techniques of Garment Closures:

Application of zippers-fly, kissing lap, button & button holes, hooks, and eye snaps. Velcro, eyelets, cords. Cuffs – Contoured cuffs, Roll-up Cuffs.

### List of Experiments:-

1. Taking measurements directly from dress form, live model and garment
2. Practical use of pattern making tools and stitching machines.
3. Draft 5 piece pattern set and stitch samples for it.
4. Draft basic pattern set for girls and boys.
5. Draft pattern for baba suit.
6. Draft pattern for romper.
7. Draft pattern for jump suit.
8. To develop patterns by using dart manipulation techniques.
9. Adopt and stitch patterns using dart cluster and dart equivalents
10. Prepare and stitch patterns for graduated and radiating darts
11. Adopt and stitch patterns for puff and raglan sleeve.
12. Adopt and stitch patterns for collar with stand and peter pan collar
13. Prepare samples for various seam classes

14. Draft and prepare sample for patch and side pockets.
15. Draft and prepare samples for shirt and sleeve placket
16. Visit to garment industry

**Reference Books:-**

1. Gerry Cooklin "Introduction to Clothing Manufacture", Blackwell Scientific Publications SP
2. Gerry Cooklin "Master Patterns & Grading for Women's Outsize", Blackwell Scientific Publications (1995) ISBN: 0 – 632- 03915 – 9.
3. Gerry Cooklin "Master Patterns & Grading for Men's Outsize", Blackwell Scientific Publications 1992.
4. Gillian Holman - Pattern Cutting Made Easy, Blackwell Scientific Publications 1997. ISBN: 0- 7134 – 8093- 9.
5. Natalie Bray "More Dress Pattern Designing" Blackwell Scientific Publications 1986 ISBN: 0- 632-01883- 6.
6. Cooklin Gerry, "Garment Technology for Fashion Designers", Blackwell Science Ltd., 1997.
7. Claire Shaeffer, "Sewing for apparel Industry", Prentice Hall, 2000.
8. Leila Aitken, "Step by step dress making course", BBC Books, 1992.

**Course Outcome**

1. Define the various pattern making tools and Develop basic five piece pattern set
2. Explain dart manipulation techniques and dart designing.
3. Illustrate and create the patterns for sleeve, collar, pockets, yokes and plackets
4. Describe and interpret garment closures and neckline finishing

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.1 TEXTILE ELECTRONICS - I (TT/MMTT/TPE/TC)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

**Course Objectives:**

1. To classify electronic components and calculate values of passive components
2. To explain the operation and applications of semiconductor devices, electromechanical devices.
3. To understand working principle of different types of sensors and transducers.
4. To demonstrate applications of sensors and transducers in textiles.

**1) Electronics Components**

Electronics components, passive components, resistors, color coding of resistors, Variable resistors, capacitors and inductors

**2) Semiconductors**

Classification of materials- metals, insulators and semiconductors, intrinsic semiconductor, extrinsic semiconductors, p-n junction diode, junction theory, VI characteristics of p-n junction diode, use of diode in rectifiers, half wave rectifier, full wave rectifiers, performance of rectifiers, filters-shunt capacitor filter, series inductor filter, zener diode, zener regulator, diode specification.

**3) Transistor**

Construction, working of transistor, transistor configurations, common emitter characteristics, transistor amplifying action, Basic CE amplifier

**4) Op-Amp**

Introduction, block diagram, symbol, ideal op-amp, open loop op-amp configuration, Concept of feedback in amplifier, +ve and -ve feedback, op-amp with negative feedback, IC741-pinout and specifications

### **5) Power Semiconductor Devices and Applications**

SCR construction, operation, turning ON and OFF of SCR, SCR characteristics, Triac- Construction, working and characteristics, diac- Construction, working and characteristics, UJT -Construction, working and characteristics. UJT as Relaxation Oscillator, SCR in DC Motor speed control, AC power control using triac, power MOSFET, IGBT, power modules

### **6) Optoelectronic Devices**

Classification of optoelectronic devices- emitters, sensors, optocouplers; photodiode, phototransistor, LDR, photo voltaic cell, LED, optocouplers, optical shaft encoders, application of optoelectronic devices in textile

### **7) Transducers**

Introduction, transducer classification – Primary and secondary transducers, active and passive transducers, analog and digital transducers, basic requirements of transducers, Pressure measurement –bourdon tubes, bellows and diaphragms; Temperature Transducers – RTD, Thermocouple, Thermistors; Strain gauge- working principle, types; Linear variable differential transformers (LVDT), Capacitive transducers, Piezo electric transducers, proximity sensors

Note: Emphasis should be given on applications of above transducers in textiles

### **8) Electromechanical Devices**

Electromagnetic relay, solenoids, solenoid valve, limit switches, electromagnetic clutches and breaks

### **List of Experiments:-**

1. Forward and reverse bias characteristics of diode.
2. Half wave rectifier (with and without filter).
3. Center tap full wave rectifier (with and without filter).
4. Bridge rectifier (with and without filter).
5. Reverse characteristics of zener diode.
6. I/O characteristics of transistor in CE configuration
7. Op-amp inverting and non-inverting amplifier.
8. UJT characteristics
9. SCR characteristics



10. AC power control using triac.
11. LDR characteristics.
12. Speed measurement using optical and magnetic pickups.
13. RTD characteristics
14. Temperature measurement using thermister
15. Weight measurement using strain gauge.
16. Displacement measurement using LVDT

**Reference Books:-**

1. Electronics Components and Materials by Madhuri Joshi
2. A Textbook of Applied Electronics by R. S. Sedha
3. Basic Electronics by B. L. Therja
4. Electrical and Electronics Measurements and Instrumentation by A.K.Sawhey, Dhanpat Ria and Sons Pub.
5. Instrumentation Devices and Systems by C.S. Rangan, G.R. Sharma, TMH Pub
6. Op-amp and Linear Integrated Circuits by Ramakant Gaykwad

**Course Outcomes:**

Student will be able to,

- 1 Classify electronic components and calculate values of passive components
- 2 Explain the operation and applications of semiconductor devices, electromechanical devices.
- 3 Understand working principle of different types of sensors and transducers.
- 4 Demonstrate applications of sensors and transducers in textiles.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.2 TEXTILE MATHEMATICS - IV (TT/MMTT/TPE/TC/FT)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

**Course Objectives:**

1. To explain Laplace transform & inverse of it with examples. To apply Laplace transform for solving L.D. equations
2. To teach vector differentiation with examples. To define Fourier series and explain formulae and solve examples
3. To demonstrate one way / two way analysis of variance with application in textiles
4. To study design of experiment of various types with examples. To teach analysis of factorial experiment and draw conclusions

**1. Laplace Transforms:**

Definition, transforms of standard functions, transforms of derivatives, and integrals. Inverse Laplace transforms by partial fraction and convolution method.

**2. Applications of Laplace Transforms:**

Application for solving L.D. equations, Method of solving L. D. equations with initial conditions (Boundary Values) with the help of Laplace Transforms.

**3. Vector differentiation:**

Differentiation of vector valued function of scalar 't', gradient, divergence, curl, directional derivative. 'Solenoidal' and 'Irrotational' vector fields.

**4. Fourier Series:**

Definition, Euler,s formulae, Conditions for fourier expansions. Full range fourier series and half range expansions and their examples.

**5. Analysis of Multivariate Data:**

Multiple correlation coefficient, Partial correlation coefficient, Plane of regressions.

**6. Analysis of Variances:**

Introduction, One-way analysis of variance, Two-way analysis of variance with and without repetition.

**7. Design of Experiments:**

Introduction, Basic principles, Basic Designs (CRD, RBD & LSD).

**8. Factorial Experiments:**

Introduction & types,  $2^n$  factorial experiments,  $2^2$  &  $2^3$  factorial experiments.

**Reference Books:-**

1. A Text Book of Applied Mathematics: by J.N. & P.N. Watikar.
2. Higher Engineering Mathematics by B. S. Grewal.
3. A Text Book on Engineering Mathematics by Bali, Saxena & Iyengar.
4. Mathematical Statistics by J.Fruend.
5. Applied Statistics & Probability of Engineers by Montgomeri & Runger
6. Probability & Statistics for Engineers by Johnson.

**Course Outcomes:**

1. Solve problems related to Laplace and inverse Laplace transforms. Solve problems of applications of Laplace transforms for L.D. equations.
2. Solve problems of applications of Fourier series. Solve problems of applications of vector differentiation.
3. Solve and interpret problems of one-way and two-way ANOVA. Solve and interpret problems of CRD, RBD and LSD
4. Solve and interpret problems of two and three factor factorial experiments. Solve problems related to Laplace and inverse Laplace transforms.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.3 TEXTILE TESTING - II (TT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

1. To discuss significance of yarn and fabric properties.
2. To discuss the factors affecting yarn and fabric properties.
3. To explain principle and testing methodology of yarn properties.
4. To explain principle and testing methodology of fabric properties.

**1. Yarn Number**

Concept, Direct and indirect systems, Measurement of yarn number - Knowles balance, Stubbs balance, Beesley balance, Quadrant balance, Relation between yarn count and yarn diameter.

**2. Twist and Twist Measurement**

Terms and definitions, Function of twist in yarn structure, Effect of twist on yarn and fabric properties, Measurement of twist in single and double yarns – Straightened fibre method, Twist contraction method, Twist to break method, Optical method, Twist take up method.

**3. Evenness of Yarn**

Concept, Classification of irregularity, causes of irregularity, Measures of irregularity, Basic irregularity, Index of irregularity. Addition of irregularity, Measurement of yarn irregularity - Visual examination, Cutting & weighing method, Electronic capacitance principle, Variation of thickness under compression, Analysis of irregularity – Variance length curves, spectrogram, Importance of yarn uniformity.  
Imperfections – Concept, Causes and importance.

Classimat faults: Classification of faults and its causes. Principle & working of Classimat tester.

Hairiness in spun yarn - Concept, Causes, Reduction & Measurement of hairiness- Photoelectric method.

#### **4. Yarn Strength**

Terms and Definitions, Effect of fibre properties on the yarn strength, Factors affecting the tensile properties of textiles

a) Single yarn strength - The pendulum lever principle, Strain gauge transducer principle, Machines working on these principles, interpretation of test results.

b) Lea Strength - The lea CSP or Break factor & its significance – Description of lea strength tester, comparison of lea & single yarn test results, Ballistic test & its importance.

#### **5. Testing of Manmade filament yarns:**

Crimp rigidity and crimp contraction, Loop instability, Physical bulk, Dynamic thermal tester and determination of filament yarn characteristics using Dynamic thermal tester.

#### **6. Fabric thickness & fabric cover**

a) Thickness – Definition, Significance, Shirley method of measurement of fabric thickness.

b) Cover factor – Definition, Derivation of cover factor, Significance.

#### **7. Mechanical Properties of Fabric**

a) Fabric Strength – Importance of fabric strength test, Sampling of fabric, , Tensile strength testing – Cut strip test, Grab test, comparison of strip test & grab test, Tear strength test, Bursting test.

b) Abrasion Resistance of fabric – Serviceability, wear, abrasion, Factors affecting abrasion resistance, assessment of abrasion damage, BFT abrasion testing machine, Martindale abrasion tester.

c) Pilling - Concept, mechanism of pilling, factors affecting fabric pilling, ICI Pill Box Tester.

## 8. Aesthetic Properties of Fabric

- a) Fabric Stiffness – Concept, Importance of stiffness and Drape, measurement of stiffness: Shirley stiffness tester (cantilever principle), Heart loop test.
- b) Drape – Concept, Measurement of drape by Drape meter, Factors affecting stiffness and drape.
- c) Crease resistance & crease recovery – Concept, Measurement of crease recovery, Factors affecting crease recovery.

## 9. Transport Properties of Fabric

- a) Air permeability – Concept, Importance, air permeability, air resistance, air porosity, Shirley air permeability tester, Factors affecting air permeability.
- b) Water fabric relations – Concept, Importance, Water proofing & water repellency, Mechanics of wetting, Wetting time test, Spray test, Drop penetration test, Bundesmann test, Water head test.

### List of Experiments:-

1. Determination of yarn Linear Density.
2. Determination of twist in single yarn.
3. Determination of twist in double yarn.
4. Determination of single yarn strength.
5. Determination of yarn lea strength.
6. Determination of ballistic strength of yarn/fabric.
7. Evaluation of yarn unevenness by capacitance principle.
8. Evaluation of yarn unevenness by visual examination.
9. Determination of fabric strip strength.
10. Determination of tearing strength of fabric.
11. Assessment of abrasion resistance of fabric.
12. Evaluation of stiffness of fabric.
13. Estimation of crease recovery angle.
14. Estimation of drapability of fabric.
15. Assessment of fabric pilling propensity.
16. Determination of filament yarn characteristics using Dynamic thermal tester.

**Reference Books:-**

1. Principles of Textile Testing, J.E.Booth, CBS Publishers & Distributors, 1996.
2. Physical properties of Textile Fibres, J. W. S. Morton & Hearle.
3. Physical Testing of textiles, B. P. Saville.
4. Handbook of Indian Standards.
5. Quality control and Testing, V. K. Kothari.
6. Textile testing Fibre, Yarn and Fabric, Arindam Basu, Published by SITRA, Coimbatore.

**Course Outcome**

Student will be able to,

1. Understand significance of yarn and fabric properties.
2. Discuss the factors affecting yarn and fabric properties.
3. Test yarn properties and interpret the results.
4. Test fabric properties and interpret the results.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.4 CHEMICAL PROCESSING OF TEXTILES - I (TT/MMTT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives :**

1. To describe the objects of sizing and preparatory processes.
2. To describe the process sequence for processing of various types of fibres.
3. To explain the role of different chemicals used in preparatory processes.
4. To explain the objectives and effects of mercerization on cellulose.

**CHAPTER – 1 SIZING**

Objects of sizing, Size paste ingredients with their functions, Adhesives and their classification. Introduction of natural, modified and synthetic adhesives. Importance of various properties like viscosity, keeping and congealing. Size paste formulation for various types of yarn. Concept of size pick up, % add on, its importance in weaving.

**CHAPTER – 2 GREY INSPECTION**

Importance of grey inspection, point based inspection systems, Four point & ten point system & numerical for acceptance & rejection of fabrics. Inspection machines.

**CHAPTER – 3 PRETREATMENTS**

Introduction of pretreatments in wet processing. Various pretreatment sequences for yarn, woven, Knits, synthetics & their blends Introduction to shearing and cropping process. Objects, working principle. Objects of singeing. Gas singeing for woven & knitted fabrics. Introduction to efficiency of singeing

**CHAPTER – 4 DESIZING**

Objects of desizing, Mechanism of desizing. Various methods of desizing: Hydrolytic & oxidative method of desizing, Desizing of Cotton, P/C and Polyester fabrics, Degumming of silk, Evaluation of efficiency of desizing.



## **CHAPTER – 5 SCOURING**

Objects of scouring, Alkaline scouring, solvent scouring and bio scouring, Study of batch-wise & continuous methods of scouring, Evaluation of efficiency of scouring.

## **CHAPTER – 6 BLEACHING**

Objects of bleaching. Introduction to bleaching agents like sodium hypochlorite, hydrogen peroxide, sodium perborate and potassium permanganate. Bleaching of cotton & its blends with synthetics. Batch-wise & continuous machinery for bleaching, Bleaching of wool, silk, Concept of AOX, Evaluation of the efficiency of bleaching.

## **CHAPTER – 7 MERCERIZATION**

Introduction & objects of mercerization, Effect of mercerization on structure of cellulose. Study of machinery used for mercerization of yarn, woven and knit fabrics. Effect of various parameters on mercerization efficiency, Concept of hot mercerization & liquid ammonia treatment, Introduction to barium activity number.

### **List of Experiments:-**

- 1) Testing of adhesives used in sizing.
- 2) Testing of softener used in sizing.
- 3) Testing of wetting agents used in preparatory processes.
- 4) Acid and enzymatic desizing of Cotton fabrics.
- 5) Batch wise alkaline scouring of cotton fabric and *PIC* blend.
- 6) Semi continuous scouring of cotton fabrics.
- 7) Bio scouring of Cotton knitted fabrics.
- 8) Hypochlorite bleaching of Cotton fabrics.
- 9) Peroxide bleaching of Cotton fabrics.
- 10) Mercerization of cotton hank.
- 11) Determination of mercerization efficiency by BAN method.
- 12) Degumming of silk.
- 13) Scouring & bleaching of wool.
- 14) Determination of whiteness index, yellowness index of bleached & OBA treated fabrics by using CCM.
- 15) Visit to sizing unit and process house.

**Reference Books:-**

1. Sizing by Prof. D. B. Ajgaonkar, Dr. M. K. Talukdar & V. R. Wadekar
2. Chemical processing of textiles, NCUTE publication. .
3. Chemical processing of polyester / cellulosic blends by R. M. Mittal & S. S. Trivedi.
4. Mercerization by J.T. Marsh.
5. Introduction to Textile Bleaching by J. T. Marsh.
6. Bleaching, Dyeing & Chemical technology of textiles fibres by E. R. Trotman.
7. Technology of Bleaching by V. A. Shenai.
8. Warp Sizing by Paul V. Seydel.

**Course Outcomes:**

1. Student will be able to illustrate the importance of sizing and pretreatments.
2. Student will be able to describe process sequence for processing of various fibres.
3. Student will be able to understand objectives, mechanism and classification of mechanical and chemical preparatory processes.
4. Student will be able to judge the changes that take place in textiles during mercerization.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.5 YARN FORMING TECHNOLOGY - IV (TT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

- 1 To explain basic principles, raw material preparation, processes and parameters of yarn doubling, open end spinning and yarn conditioning.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in yarn doubling, open end spinning and yarn conditioning.
- 3 Explanation to enumerate productivity, efficiency related calculations and selection of process parameters of yarn doubling, open end spinning and yarn conditioning.
- 4 Describe utilities, maintenance needs and features of modern yarn doubling, open end spinning and yarn conditioning machines and acquaint the students with industrial working by organizing industrial visits.

**1) Yarn Folding and Doubling:-**

Object of ply twisting - Scope of ply twisting - Methods of ply twisting, concept of balance of twist. Study of conventional ring doubling machines. Calculation relating to production, efficiency and twist – Limitation of ring doubling system

**2) Study of Two for One Twisters –**

Evolution of TFO, Basic concepts, study of design and construction of two for one twisting machine. Machine design aspects, drives used, power requirement, calculations relating to efficiency, production and twist. Advantages over ring doubling. Techno economics. Modern developments in TFO machines.

**3) Fancy Yarn Production –**

Classification of fancy yarns - basic principle - study of productions methods - spinning techniques for the production of fancy yarns – Design and construction of the basic profiles such as Spiral, Gimp, Loop, Snarl, Knop, Cover, Slub, Nepy.

**4) Production of Elastomeric and Air Covering:**

Production and preparation of Melange yarn, Lycra, Elastane yarns, Singed yarn etc.

**5) Principle of Rotor Spinning:**

Limitation of ring spinning system. Drafting and stages involved in openend spinning – developments of twisting elements of open-end spinning, Structure and properties and applications of rotor yarns.

**6) Study of Constructional Details of Rotor Elements:**

Fibre separation and transportation, Fibre deposition and twist insertion and winding.

**7) Design Aspects of Rotor Spinning Elements:**

Developments in Fibre separation and transportation, Fibre deposition and twist insertion and winding, rotor drives, Yarns monitoring in rotor spinning.

**8) Automation in Rotor Spinning Machine:**

Technological developments in spinning and processing of rotor spun yarns, effect of trash in sliver, cleaning at rotor, production of fine rotor yarns, processing of man -made staple and their blends, specialty yarns on rotor spinning machines.

**9) Yarn Conditioning :-**

Principle and scope of yarn conditioning, conditioning procedure, design and operational details of yarn conditioning systems.

**List of Experiments:-**

**Any Twelve experiments are to be conducted in a term.**

1. Study of TFO – passage, gearing, calculations related to twist, speed, production.
2. Study of Ring-doublers – passage, gearing, calculation related to twist, speed and production.
3. Manufacture of package on soft/parallel winding machine at various process parameters.
4. Production of slub yarns using Fancy yarn making device.
5. Manufacture of multi-twist and multi-count yarn.
6. Production of SIRO, Double yarn and comparison of the same with ring spun yarn.
7. Study of Rotor spinning machine and constructional details of rotor
8. To study of yarn conditioning and its effect on yarn quality.
9. Production of yarn on Air Covering Machine and to study the characteristics of air-covered yarn.
10. Mill visit–Study of Yarn conditioning, Packaging.
11. Mill visit–Study of Two for One twister.
12. Mill visit–Study of Rotor spinning machine.
13. Comparative study of OE yarn and ring yarn.
14. Production of lycra core yarn on ring frame
15. Production of open end yarn and testing of it's quality
16. Calculation of winding parameters from package.

**Reference Books:-**

- 1) Fundamentals of Spinning – P. Lord / C. A. Lawarance
- 2) Technology of Cotton Spinning – J. Janakiram
- 3) Trade Literature and Bulletins of Rieter LMW, Marzoli
- 4) NCUTE Pilot programmes in spinning.
- 5) SITRA Focus series.
- 6) Elements of ring frame and doublings by A. R. Kahre.
- 7) Manual of Textile Technology – Short Staple Series.
- 8) Vol V Modern spinning systems – W. Klein
- 9) Advances in Spinning – S. M. Ishtiaque

- 10) Two for one Twister technology and Technique for spun yarns by H. S. Kulkarni and HVS Murty.

**Course Outcome**

- 1 To explain basic principles, raw material preparation, processes and parameters of yarn doubling, open end spinning and yarn conditioning.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in yarn doubling, open end spinning and yarn conditioning.
- 3 Explanation to enumerate productivity, efficiency related calculations and selection of process parameters of yarn doubling, open end spinning and yarn conditioning.
- 4 Describe utilities, maintenance needs and features of modern yarn doubling, open end spinning and yarn conditioning machines.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.6 FABRIC FORMING TECHNOLOGY - IV (TT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives:**

1. To explain mechanisms on modern sizing machines and their working and functions
2. To explain the weave and the fabric construction of pile, carpets and extra thread figuring.
3. demonstrate and explain the method of making card cutting plan for jacquard designs
4. To explain the construction and working of shuttle less weaving machines

**1. SIZING:-** Study of modern sizing machine element.

1. Creel - construction, braking arrangement & positive drive.
2. Size Box – design of various modern size boxes
3. Drying Cylinders - Heating arrangement, coating, temperature & its control, pressure of steam, thermal performance of drying cylinders, steam traps.
4. Head Stock - Dry splitting, measuring motion, drag roller, comb & drive to weavers beam, pressuring device.
5. Control Systems- modern sizing machine drive for moisture, temperature, size level and stretch.
6. Factors affecting size pick up & size add-on, migration.
7. Assessment of sizing performance - laboratory & practical methods.
8. Concept of single end sizing & various methods.
9. Concept of dyeing cum sizing.
10. Automation and MIS on modern machines.
11. Calculations - Related to size concentration, size pick up, stretch, drying, count of warp, production etc.

## **2. FABRIC STRUCTURE:-**

a) Study of following weaves and weave characteristics requirements.

1. Warp pile - wire method, face to face weaving & terry pile.
2. Introduction to tufted carpets.
3. Weft pile - velveteens & velours

b) Construction & Development of Jacquard Designs:-

1. Elements of Jacquards shedding - Double lift, Jacquard with single & double cylinder working, Jacquard sizes, Harness tie, Harness drawing - in, card cutting & card lacing.
2. Harness & design calculation - Setting of harness, number of harness cords to each hook, casting out, size of repeat, count of design paper.
3. Development of Jacquard Designs - Construction of square paper designs, Process of drafting a sketch design, drafting designs from woven fabrics.
4. Development of figures - Prevention of long floats, bold & flat development, Development of large figures, use of warp & weft float, figure shading.
5. Insertion of ground weavers.
6. Factors influence woven designs.

c) Figuring with extra threads: - Principles, extra warp, extra weft figuring, combination, limitation, extra thread effect & weaving.

d) Gauze and Leno – Principles, basic sheds, leno with flat steel doups and slotted doups, point draft or counter leno, simultaneous top and bottom douping, applications of slotted doups and double slotted doups, easing and shaker motion concept, working and construction.

## **3. SHUTTLELESS WEAVING:-**

Limitations of shuttle loom.

Classification of shuttle less weaving machines.

a) Projectile weaving machine –

History of shuttle less weaving machine; Machine drive, various motions timing, Beat-up motion, Projectile picking, motion, picking phases, Projectile acceleration & retardation, torsion rod details, Projectile preparation for picking, selvedge motion, Receiving unit, Let-off motion (Mechanical & power), Take-up motion, their advantages in relation to shuttle loom motions, specifications of



projectiles & grippers for various applications, all auxiliary motions such as brake, clutch, oiling, cleaning, MIS, pick finding, Multi colour weft insertion, weft stop, warp stop, whip roller, weft brake etc.

b) Rapier Weaving Machine

Various models of rapier weaving machines & their brief history.

Study of weft velocity curves for looms with different methods of weft insertion.

Classification of raier weaving machine and their weft insertion principles.

Concept of Dewas & Gabler rapier systems, their comparison Study of effect of reed width on loom speed their comparison. Study of rapier heads.

machine drive, Timings of various motions, & beat up motion, , Details of rapier tape, head, sely construction, guiding elements, Gripper openers, cutters, stroke adjustment. Selvedge forming elements & adjustments.

Let-off & take up motion their adjustments for various pick density range, .

All auxiliary motions such as brake, clutch oiling, cleaning, MIS, General electronic circuit, pick finding, multi colour weft insertion, weft-stop, warp stop, whip roller, weft brake etc.

Fabric defects & remedies of shuttleless machines weft waste during selvedge formation.

Detailed study of Dornier rigid rapier weaving machine on above line.

**List of Experiments:-**

1. Study of warp stop motions.
2. Loom operating - starting, stopping, knotting, & drawing -in & study of fabric defects.
3. General study of projectile machine and drive arrangements for various motions.
4. Study of Sulzer picking motion.
5. Study of style change process on projectile (Sulzer) Machine.
6. General study of flexible Rapier machine & drive arrangements for various motions.
7. General study of rigid Rapier machine & drive arrangements for various motions.
8. Study of control panel of Dornier weaving machine.

9. Study of style change of Dornier weaving machine.
10. Visit to rapier weaving unit.
11. Visit to modern sizing unit.
12. Study of Jacquard card punching equipment and preparation of card for one pick.
13. Visit to Jacquard unit.
14. Fabric analysis of pile structures.
15. Fabric analysis of leno structures.
16. Fabric analysis - Extra warp & weft.

**Reference Books:-**

1. The Technology of Warp Sizing by J.B. Smith.
2. Modern Preparation & Weaving by A. Ormerod.
3. Textile Maths Vol.III by J.E. Booth
4. Principles of weaving by Marks & Robinson.
5. Weaving machines & methods by Dr. Talukdar, Prof. D.B. Ajgaonkar.
6. Sizing by Sydel.
7. Shuttleless weaving by Svaty.
8. Modern Methods of Weaving by Duxburng.

**Course Outcome**

Student will be able to:

1. Understand mechanisms on modern sizing machines and their working and functions
2. Understand the weave and the fabric construction of pile, carpets and extra thread figuring.
3. Demonstrate and explain the method of making card cutting plan for jacquard designs
4. Understand the construction and working of shuttle less weaving machines

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.3 MAN MADE FIBRE MANUFACTURE - II (MMTT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives:**

1. To illustrate the manufacturing process for polyester, polyamide, polypropylene, Polyacrylonitrile, regenerated cellulosic fibers and spandex staple and filament yarns.
2. To explain the structure and properties of polyester, polyamide, polypropylene, polyacrylonitrile, regenerated cellulosic fibers and spandex fibres.
3. To demonstrate drawing and heat setting processes for filament yarns.
4. To appraise the characterization methods of fibres and filament yarns

**Unit 1:**

**Polyester Fibres:**

Poly(ethylene terephthalate fibre) – Overview of the processes to produce Poly(ethylene terephthalate) staple/ filament yarns. Polymer production, fibre/filament yarn production, structure and properties of Poly(ethylene terephthalate) fibre Developments in Poly(ethylene terephthalate) fibres, applications

Poly(ethylene terephthalate) micro fibre/ filament yarns, their production, properties and applications.

Polyester 3GT fibre-Production, Properties and applications

**Unit 2:**

**Polyamide Fibres:-**

Nylon 6, nylon 6, 6 polymer, fibres/filament yarn production, structure and properties of nylon 6 and nylon 6,6 fibres. Applications of polyamide fibres. Developments in polyamide fibres,

**Unit 3:**

Polypropylene Fibres:-

Tacticity of polypropylene polymer, production of polypropylene polymer, production of polypropylene fibres/filament yarns, problems in the fibre production and possible causes, structure and properties of polypropylene fibres, application areas.

**Unit 4:**

Acrylic Fibre (PAN ) :-

Production of PAN polymer for acrylic and modacrylic fibres. Spinning of PAN fibres, structure and properties of PAN fibres, application areas, Developments in acrylic fibres.

**Unit 5:**

Viscose Fibres:-

Production of viscose fibres – preparation of spinning solution, spinning of fibres, HWM & LWM fibres, structure and properties of viscose fibres, Developments in viscose fibres. Applications of viscose fibres.

Tencel/Lyocell Fibres:-

Production of Tencel fibre, properties and application of Tencel fibre.

Acetate Fibres:-

Production, properties and application of acetate and triacetate fibres.

**Unit 6:**

Tape yarns:-

Production, Properties and application areas for tape yarns.

Elastomeric Fibres:-

Extensibility and recovery mechanism, Elastomeric fibre production. Properties of elastomeric fibres and application areas.

**List of Experiments:-**

1. Demonstration of high speed draw winder and production of FDY.
2. Demonstration of CRAPE TFO machine.
3. Effect of hot plate and godet temperature of high speed draw winder on drawn yarn characteristics.
4. Effect of stabilizing overfeed of high speed draw winder on drawn yarn characteristics.
5. Production of intermingled yarns using draw winder and study of their characteristics.
6. Determination of the density of fibre by using Density Gradient Column.
7. Determination of the spin finish of the given sample by cold extraction method.
8. Determination of the draw force of POY using Dynafil Tester.
9. Determination of the shrinkage force of FDY using Dynafil Tester.
10. Determination of the crimp contraction force of textured yarns using Dynafil tester.
11. Effect of heat-setting temperature on the dimensional stability of filament yarns.
12. Effect of heat setting time on the dimensional stability of filament yarns.
13. Effect of heat setting tension on the dimensional stability of filament yarns.
14. To study the influence of twist on filament yarn characteristics.
15. Comparison of boiling water shrinkage and hot air shrinkage of filament yarns.
16. Industrial Visit.

**List of References:-**

1. Manufactured fiber technology - Edited By V.B. Gupta, and V.K. Kothari, Chapman and Hall, London.
2. Synthetic fibre production – A.A. Vaidya.
3. Fibre science and technology – S.P. Mishra. New Age International Publishers
4. Book of papers of NCUTE training programmes conducted at IIT New Delhi on man made fibres.
5. Man-Made fibres – R.W. Moncrieff. John Wiley, Newyork.

6. Hand book of textile fibres Vol-II – Man Made Fibres, By J.Gorden Cook.Wood Head Publishing Ltd.,
7. Production and application of poly propylene fibres – O. pagjart B. Reichstadts,F.Sevcik.Elservier scientific Publishing company,Amesterdam
8. Technology Of Textile Processing- Vol-I ,Textile Fibres– V.A. Shenai, Shevak Publishers ,Mumbai

**Course Outcome:**

Students will be able to:

1. Understand the manufacturing process of polyester, polyamide, polypropylene, Polyacrylonitrile, regenerated cellulosic fibers and spandex staple and filament yarns
2. Analyze the structure and properties of polyester, polyamide, polypropylene, polyacrylonitrile, regenerated, cellulosic fibers and spandex fibres.
3. Use filament drawing and heat setting processes for fully drawn yarn manufacturing
4. Select and test the fibers and filament yarns for various characteristics

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.5 MAN MADE STAPLE YARN MANUFACTURE - IV (MMTT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

- 1 To explain basic principles, raw material preparation, processes and parameters of yarn doubling, open end spinning and yarn conditioning.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in yarn doubling, open end spinning and yarn conditioning.
- 3 Explanation to enumerate productivity, efficiency related calculations and selection of process parameters of yarn doubling, open end spinning and yarn conditioning.
- 4 Describe utilities, maintenance needs and features of modern yarn doubling, open end spinning and yarn conditioning machines and acquaint the students with industrial working by organizing industrial visits.

**1) Yarn Folding and Doubling:-**

Object of ply twisting - Scope of ply twisting - Methods of ply twisting, concept of balance of twist. Study of conventional ring doubling machines. Calculation relating to production, efficiency and twist – Limitation of ring doubling system

**2) Study of Two For One Twisters –**

Evolution of TFO, Basic concepts, study of design and construction of two for one twisting machine. Machine design aspects, drives used, power requirement, calculations relating to efficiency, production and twist. Advantages over ring doubling. Techno economics. Modern developments in TFO machines.

3) **Fancy yarn production –**

Classification of fancy yarns - basic principle - study of productions methods - spinning techniques for the production of fancy yarns – Design and construction of the basic profiles such as Spiral, Gimp, Loop, Snarl, Knop, Cover, Slub, Nepy.

4) **Production of elastomeric and air covering:**

Production and preparation of Melange yarn, Lycra, Elastane yarns, Singed yarn etc.

5) **Principle of Rotor Spinning:**

Limitation of ring spinning system. Drafting and stages involved in openend spinning – developments of twisting elements of open-end spinning, Structure and properties and applications of rotor yarns.

6) **Study of constructional details of rotor elements:**

Fibre separation and transportation, Fibre deposition and twist insertion and winding.

7) **Design aspects of rotor spinning elements:**

Developments in Fibre separation and transportation, Fibre deposition and twist insertion and winding, rotor drives, Yarns monitoring in rotor spinning.

8) **Automation in Rotor Spinning Machine:**

Technological developments in spinning and processing of rotor spun yarns, effect of trash in sliver, cleaning at rotor, production of fine rotor yarns, processing of man -made staple and their blends, specialty yarns on rotor spinning machines.

9) **Yarn Conditioning :-**

Principle and scope of yarn conditioning, conditioning procedure, design and operational details of yarn conditioning systems.



**List of Experiments:-**

**Any Twelve experiments are to be conducted in a term.**

- 1) Study of TFO – passage, gearing, calculations related to twist, speed, production.
- 2) Study of Ring-doublers – passage, gearing, calculation related to twist, speed and production.
- 3) Manufacture of package on soft/parallel winding machine at various process parameters.
- 4) Production of slub yarns using Fancy yarn making device.
- 5) Manufacture of multi-twist and multi-count yarn.
- 6) Production of SIRO, Double yarn and comparison of the same with ring spun yarn.
- 7) Study of Rotor spinning machine and constructional details of rotor
- 8) To study of yarn conditioning and its effect on yarn quality.
- 9) Production of yarn on Air Covering Machine and to study the characteristics of air-covered yarn.
- 10) Mill visit–Study of Yarn conditioning, Packaging.
- 11) Mill visit–Study of Two for One twister.
- 12) Mill visit–Study of Rotor spinning machine.
- 13) Comparative study of OE yarn and ring yarn.
- 14) Production of lycra core yarn on ring frame
- 15) Production of open end yarn and testing of it's quality
- 16) Calculation of winding parameters from package.

**Reference Books:-**

- 1) Fundamentals of Spinning – P. Lord / C. A. Lawarance
- 2) Technology of Cotton Spinning – J. Janakiram
- 3) Trade Literature and Bulletins of Rieter LMW, Marzoli
- 4) NCUTE Pilot programmes in spinning.
- 5) SITRA Focus series.
- 6) Elements of ring frame and doublings by A. R. Kahre.
- 7) Manual of Textile Technology – Short Staple Series.
- 8) Vol V Modern spinning systems – W. Klein
- 9) Advances in Spinning – S. M. Ishtiaque

- 10) Two for one Twister technology and Technique for spun yarns by H. S. Kulkarni and HVS Murty.

**Course Outcomes**

- 1 To explain basic principles, raw material preparation, processes and parameters of yarn doubling, open end spinning and yarn conditioning.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in yarn doubling, open end spinning and yarn conditioning.
- 3 Explanation to enumerate productivity, efficiency related calculations and selection of process parameters of yarn doubling, open end spinning and yarn conditioning.
- 4 Describe utilities, maintenance needs and features of modern yarn doubling, open end spinning and yarn conditioning machines.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.6 MAN MADE FABRIC FORMING TECHNOLOGY - IV (MMTT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

1. 1 To explain mechanisms on modern sizing machines and their working and functions
2. 2 To explain the weave and the fabric construction of pile, carpets and extra thread figuring.
3. To demonstrate and explain the method of making card cutting plan for jacquard designs
4. To explain the construction and working of shuttle less weaving machines

**1. SIZING:-** Study of modern sizing machine element.

1. Creel - construction, braking arrangement & positive drive.
2. Size Box - various size boxes, 1 nip 1 dip, 2 nip 2 dip, dressing rollers, etc
3. Drying Cylinders - Heating arrangement, coating, temperature & its control, pressure of steam, thermal performance of drying cylinders, steam traps.
4. Head Stock - Dry splitting, measuring motion, drag roller, comb & drive to weavers beam, pressuring device
5. Control Systems- modern sizing machine drive of moisture, temperature, size level, and Stretch.
6. Factors affecting size pick up & size add-on, migration.
7. Assessment of sizing performance - laboratory & practical methods.
8. Concept of single end sizing & various methods.
9. Concept of dyeing cum sizing.
10. Automation and MIS on modern machines.
11. Calculations - Related to size concentration, size pick up, stretch, drying, count of warp, production etc.

## **2. FABRIC STRUCTURE:-**

a) Study of following weaves and weave characteristics requirements.

1. Warp pile - wire method, face to face weaving & terry pile.
2. Introduction to tufted carpets.
3. Weft pile - velveteens & velours

b) Construction & Development of Jacquard Designs:-

1. Elements of Jacquards shedding - Double lift, Jacquard with single & double cylinder working, Jacquard sizes, Harness tie, Harness drawing - in, card cutting & card lacing.
2. Harness & design calculation - Setting of harness, number of harness cords to each hook, casting out, size of repeat, count of design paper.
3. Development of Jacquard Designs - Construction of square paper designs, Process of drafting a sketch design, drafting designs from woven fabrics.
4. Development of figures - Prevention of long floats, bold & flat development, Development of large figures, use of warp & weft float, figure shading.
5. Insertion of ground weavers.
6. Factors influence woven designs.

c) Figuring with extra threads: - Principles, extra warp, extra weft figuring, combination, limitation, extra thread effect & weaving.

d) Gauze & Leno: Principles, basic sheds, leno with flat steel doups And slotted doups, point draft or counter leno, simultaneous top & bottom douping, application of slotted doups, easing and shaker motion concept, working and construction

## **3. SHUTTLELESS WEAVING:-**

Limitations of shuttle loom with respect to weaving process, engineering aspects & environmental aspects.

Classification of shuttle less weaving machines.

a) **Projectile weaving machine –**

History of shuttle less weaving machine; Machine drive, various motions timing, Beat-up motion, Projectile picking , motion, picking phases, Projectile acceleration & retardation, torsion rod details, Projectile preparation for picking, selvedge motion, Receiving unit, , Let-off motion (Mechanical & power), Take-up motion, their advantages in relation to shuttle loom motions, specifications of projectiles & grippers for various applications, all auxiliary motions such as brake, clutch, oiling,

cleaning, MIS, General electronic circuit, pick finding, Multi colour weft insertion, weft stop, warp stop, whip roller, weft brake etc.

#### **b) Rapier Weaving Machine**

Various models of rapier weaving machines.

Study of weft velocity curves for looms with different methods of weft insertion. Classification of rapier weaving machine and their weft insertion principles Concept of Dewas & Gabler rapier systems, their comparison. Study of effect of reed width on loom speed their comparison. Study of rapier heads.

machine drive, Timings of various motions, cam shedding & beat up motion, Details of rapier tape, head, sely construction, guiding elements, Gripper openers, cutters, stroke adjustment. Selvedge forming elements & adjustments.

Let-off & take up motion, their adjustments for various pick density range.

All auxiliary motions such as brake, clutch oiling, cleaning, MIS, General electronic circuit, pick finding, multi colour weft insertion, weft-stop, warp stop, whip roller, weft brake etc.

Fabric defects & remedies of shuttleless weaving machines weft waste during selvedge formation.

Detailed study of Dornier rigid rapier weaving machine on above line.

#### **List of Experiments:-**

1. Study of warp stop motions.
2. Loom operating - starting, stopping, knotting, & drawing -in & study of fabric defects.
3. General study of projectile machine and drive arrangements for various motions.
4. Study of Sulzer picking motion.
5. Study of style change process on projectile (Sulzer) Machine.
6. General study of flexible Rapier machine & drive arrangements for various motions.
7. General study of rigid Rapier machine & drive arrangements for various motions.
8. Study of control panel of Dornier weaving machine.
9. Study of style change of Dornier weaving machine.
10. Visit to rapier weaving unit.

11. Visit to modern sizing unit.
12. Study of Jacquard card punching equipment and preparation of card for one pick.
13. Visit to Jacquard unit.
14. Fabric analysis of pile structures.
15. Fabric analysis of leno structures.
16. Fabric analysis - Extra warp & weft.

**Reference Books:-**

1. The Technology of Warp Sizing by J.B. Smith.
2. Modern Preparation & Weaving by A. Ormerod.
3. Textile Maths Vol.III by J.E. Booth
4. Principles of weaving by Marks & Robinson.
5. Weaving machines & methods by Dr. Talukdar, Prof. D.B. Ajgaonkar.
6. Sizing by Sydel.
7. Shuttleless weaving by Svaty.
8. Modern Methods of Weaving by Duxburng.

**Course Outcome**

Student will be able to:

1. Understand mechanisms on modern sizing machines and their working and functions
2. Understand the weave and the fabric construction of pile, carpets and extra thread figuring.
3. Demonstrate and explain the method of making card cutting plan for jacquard designs
4. Understand the construction and working of shuttle less weaving machines

**SECOND YEAR B. TEXT. – SEMESTER – II****4.3 ELECTRICAL TECHNOLOGY (TPE)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	25 Marks
Term Work	:	25 Marks
Subject Total	:	150 Marks

**Course Objective**

1. To understand d.c. motor operation, characteristics and application, induction motor operation characteristics and understand application in textile industry
2. To understand servo motor operation characteristics and application in textile industry to understand concept of power quality and causes and benefits and bad effects
3. To understand economics of power generations and different tariffs and their calculations. Acquire knowledge of energy auditing and its implementation in textile engineering.
4. To understand necessity of substation its basics components and their functions. To understand energy scenario and its distribution and stock limitations and new methods for conversion.

**1. D.C. MOTORS:**

Principle, working, types, performance, characteristics and applications, speed control methods. Starters. Modern methods of speed control using thyristor, [Torque calculation and simple numerical based on speed control methods].

**2. A.C MOTORS:**

Three phase induction motors, principle, working , types, performance, characteristics, efficiency, modern methods of speed control using Electronics devices like thyristor invertors (VFD). Modern methods of starting of A.C. motors.

Selection & study of motors for various textile machineries like let off motor, take off motor, accumulator motor, main motor. Motors in humidification plant. Energy efficient motors (EEM) and ISI standards for motors used in Textile industries, possible faults in Textile motors and remedies.

### **3. SERVO MOTORS:**

Construction, principle, working, types, applications of A.C. /D.C. servo motors, stepper motors .BLDC motor.

### **4. POWER QUALITY & POWER FACTOR IMPROVEMENT:**

Concept of power quality, harmonics & methods of harmonics elimination, Concept of power triangle, active power, apparent and reactive power, various modern methods of improving power factor and its importance in industries, APFC panel , disadvantages & advantages of P.F. improvement.

### **5. TARIFF & ENERGY AUDITING:**

Different types of tariffs, load Management, concept of Energy Auditing in textile industry, Method of energy auditing, calculation of electricity bill of different textile mills and industries. [Simple problems on two-part tariff.] Saving calculation of saving by power factor improvement and load factor improvement. Concept of Specific energy consumption.

### **6. SUBSTATION & ITS COMPONENTS:**

Necessity of substation, functions of Fuses, Relays, Circuit breakers. Ratings of circuit breaker, Substation & different components of substation. Compact sub station. Importance of Size of substation and MAXIMUM DEMAND.

### **7. RENEWABLE ENERGY SOURCES:**

Concept of renewable energy sources, types of energy resources like solar energy & solar cell, wind energy, tidal energy, ocean thermal energy, geo-thermal energy, photovoltaic, biomass. Concept of co-generation plant.

### **List of Experiments:**

- 1) Speed control of D.C .Shunt motor method by flux control
- 2) Speed control of D.C. Shunt motor by Armature voltage control method.
- 3) Load test on D.C. Shunt motor.



- 4) Reversal of D.C. Shunt motors
- 5) Study of starter for D.C. motors.
- 6) Reversal of three phase A.C .induction motors
- 7) Speed control of three phase of induction motors by voltage control method.
- 8) Speed control of three phase of induction motors by pole changing method.
- 9) Measurement of three-phase power by two-watt meter method.
- 10) Load test on three phase induction motors
- 11) Study of stepper motors.
- 12) Study starter for three phase induction motors of.
- 13) Study Energy auditing system.
- 14) Study of VFD in ring frame.
- 15) Study of SUBSTATION
- 16) Study of AUTOMATIC POWERFACTOR CORRECTION SYSTEM.

**Reference Books:-**

1. Electrical Technology- by Prof. B.L. Theraja.
2. Electrical Technology- by Prof.H. Cotton
3. A.C Machines – by Prof. M.G. Say
4. Electrical Measurement and Instrumentation by Prof. A.K, Sawhny
5. Electrical Power Systems by Prof. S.L Uppal.
6. Switch Gear and Protection by Prof. S.Rao.
7. Modern Electric Traction System by Prof. H. Pratap.
8. A first course in Electrical drive –by- Prof.F.K.Pillai
9. Modern Industrial Electronics by Prof T.J. Maloney
- 10 Utility Engineering in Textile -(JET)Research Paper
- 11 Technology by Prof. U. A Bakshi.---- Text

**Course Outcome**

- 1 To understand select , operate, control d.c. motor  
To understand select, operate, control induction. Motor
- 2 To understand select ,operate, control servo motor  
To understand significance of power quality, its criteria and advantages and bad effects and cause of power quality.

- 3 To understand and calculate m.d, size of sub-station, distribution factor, load factor, tariff, energy and bill.  
To understand energy auditing and its implementation in textile industry.  
To understand necessity of sub-station and their main Components and their functions.
- 4 To understand present setups of energy and limitations of Resources and innovative conversions.

**SECOND YEAR B. TEXT. – SEMESTER – II****4.4 PHYSICAL TESTING OF TEXTILE - I (TPE)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

**Course Objectives**

1. To explain significance and selection of sample
2. To discuss technical significance of fibre properties.
3. To describe testing methodologies for evaluation of fibre properties.
4. To explain significance of moisture in textiles and its measurement.

**1. Sampling for determination of fibre properties**

Necessity of sampling, Terms: Population, Sample, Random sample, Biased sample, Factors governing sampling, Sampling methods - Zoning method, Squaring method, Cut squaring method.

**2. Longitudinal dimensions (Fibre length)**

Concept, Technical Significance of fibre length, Staple length of cotton, Length- frequency diagrams, Fibre length measurement - Oil plate method , Comb sorter method, Scanning method - Digital Fibrograph.

**3. Transverse dimensions (Fineness & Maturity)**

Fibre Fineness: Concept, Measures of fineness, Technical significance of fineness, Measurement of fineness - Microscopic method, Gravimetric method, Airflow method - Sheffield Micronaire, Vibroscope method.

Fibre Maturity: Concept, Measures of maturity, Technical significance of maturity, Measurement of maturity - Caustic soda method, Polarized light method

**4. Fibre strength**

Terms and definitions, Stress-strain curve, Importance of Tensile properties, Factors influencing fibre strength, Types of loading, Measurement of fibre strength - Single fibre strength –Strain gauge transducer principle, Bundle

fibre strength – Pendulum lever principle , Comparison of Single fibre strength and Bundle fibre strength.

**5. Moisture relations and testing**

Terms and definitions, Effect of moisture on textiles, Regain–humidity relationships, Factors affecting moisture regain, Measurement of atmospheric conditions- dry and wet bulb hygrometer, Measurement of regain –Oven dry method, Method based on resistance principle.

**6. Miscellaneous testing -**

Trash: Classification of trash, Technical significance of trash, Estimation of trash content in cotton by trash analyser.

Neps – Concept, Classification of Neps, Importance, Neps in card web – Shirley template method.

**7. Modern fibre testing instruments: - High Volume Instrument (HVI), Advance Fibre Information System (AFIS).**

**8. Testing of Manmade Fibres: - Crimp in staple fibre, Crimp Rigidity and Crimp Contraction, Shrinkage.**

**List of Experiment**

1. Study of zoning technique for selection of fibre sample
2. Fibre length by using grease plate method
3. Comb sorter method for estimation of fibre length parameters
4. Fibre fineness by cut-weight method
5. Measurement of fibre fineness and maturity by airflow instrument
6. Fibre maturity measurement by caustic soda method
7. Determination of trash content in cotton using trash analyser
8. Study of fibre parameters on AFIS
9. Study of fibre parameters on HVI
10. Determination of neps in card web by Shirley template
11. Determination of moisture content and regain by oven dry method
12. Determination of moisture content by Shirley moisture meter
13. Study of fibre bundle strength by stelometer (demo)
14. Detection of honey dew content in cotton fibre

15. Identification of textile fibre
16. Evaluation of crimp rigidity and crimp contraction of man-made fibre.

**Reference Books:-**

1. Physical Properties of Fibres, Morton and Hearle
2. Principles of Textile Testing, J.E.Booth, CBS Publishers & Distributors, 1996.
3. Manuals of HVI, AFIS
4. Physical Testing of textiles, B. P. Saville.

**Course Outcome**

Students will be able

1. To select sample.
2. To understand technical significance of fibre properties.
3. To test and interpret results of fibre properties.
4. To understand moisture- fibre relations.

**SECOND YEAR B. TEXT. – SEMESTER – II****4.5 YARN MANUFACTURING MACHINERY - IV (TPE)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

- 1 To explain basic principles, raw material preparation, processes and parameters of yarn doubling, open end spinning and yarn conditioning.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in yarn doubling, open end spinning and yarn conditioning.
- 3 Explanation to enumerate productivity, efficiency related calculations and selection of process parameters of yarn doubling, open end spinning and yarn conditioning.
- 4 Describe utilities, maintenance needs and features of modern yarn doubling, open end spinning and yarn conditioning machines and acquaint the students with industrial working by organizing industrial visits.

**1) Yarn Folding and Doubling:-**

Object of ply twisting - Scope of ply twisting - Methods of ply twisting, concept of balance of twist. Study of conventional Ring doubling machines. calculation relating to production, efficiency and twist – Limitation of ring doubling system

**2) Study of Two for One Twisters –**

Evolution of TFO, basic concepts, study of design and construction of two for one twisting machine. Machine design aspects, drives used, power requirement, calculations relating to efficiency, production and twist. Advantages over ring doubling. Techno economics. Modern developments in TFO machines.

**3) Fancy Yarn Production –**

Classification of fancy yarns - basic principle - study of productions methods - spinning techniques for the production of fancy yarns – Design and construction of the basic profiles such as Spiral, Gimp, Loop, Snarl, Knop, Cover, Slub, Nepy.

**4) Production of Elastomeric and Air Covering:**

Production and preparation of Melange yarn, Lycra, Elastane yarns, Singed yarn etc.

**5) Principle of Rotor Spinning:**

Limitation of ring spinning system. Drafting and stages involved in openend spinning – developments of twisting elements of openend spinning, Structure and properties and applications of rotor yarns.

**6) Study of Constructional Details of Rotor Elements:**

Fibre separation and transportation, Fibre deposition and twist insertion and winding.

**7) Design Aspects of Rotor Spinning Elements:**

Developments in Fibre separation and transportation, Fibre deposition and twist insertion and winding, rotor drives, Yarns monitoring in rotor spinning.

**8) Automation in Rotor Spinning Machine:**

Technological developments in spinning and processing of rotor spun yarns, effect of trash in sliver, improved cleaning at rotor, production of fine rotor yarns, rotor spinning of man made and blends, speciality yarns on rotor spinning machines, post spinning processing.

**9) Yarn Conditioning :-**

Principle and scope of yarn conditioning , Conditioning procedure, design and operational details of various yarn conditioning systems.

**List of Experiments:-**

**Any Twelve experiments are to be conducted in a term.**

1. Study of TFO – passage, gearing, calculations related to twist, speed, production.
2. Study of Ring-doublers – passage, gearing, calculation related to twist, speed and production.
3. Manufacture of package on soft/parallel winding machine at various process parameters.
4. Production of slub yarns using Fancy yarn making device.
5. Manufacture of multi-twist and multi-count yarn.
6. Production of SIRO, Double yarn and comparison of the same with ring spun yarn.
7. Study of Rotor spinning machine and constructional details of rotor
8. To study of yarn conditioning and its effect on yarn quality.
9. Production of yarn on Air Covering Machine and to study the characteristics of air-covered yarn.
10. Mill visit–Study of Yarn conditioning, Packaging.
11. Mill visit–Study of Two for One twister.
12. Mill visit–Study of Rotor spinning machine.
13. Comparative study of OE yarn and ring yarn.
14. Production of lycra core yarn on ring frame
15. Production of open end yarn and testing of it's quality
16. Calculation of winding parameters from package.

**Reference Books:-**

- 11) Fundamentals of Spinning – P. Lord / C. A. Lawarance
- 12) Technology of Cotton Spinning – J. Janakiram
- 13) Trade Literature and Bulletins of Rieter LMW, Marzoli
- 14) NCUTE Pilot programmes in spinning.
- 15) SITRA Focus series.
- 16) Elements of ring frame and doublings by A. R. Kahre.
- 17) Manual of Textile Technology – Short Staple Series.
- 18) Vol V Modern spinning systems – W. Klein
- 19) Advances in Spinning – S. M. Ishtiaque



- 20) Two for one Twister technology and Technique for spun yarns by H. S. Kulkarni and HVS Murty.

**Course Outcome**

- 1 To explain basic principles, raw material preparation, processes and parameters of yarn doubling, open end spinning and yarn conditioning.
- 2 To describe constructional details and design aspects of machine parts and mechanisms involved in yarn doubling, open end spinning and yarn conditioning.
- 3 Explanation to enumerate productivity, efficiency related calculations and selection of process parameters of yarn doubling, open end spinning and yarn conditioning.
- 4 Describe utilities, maintenance needs and features of modern yarn doubling, open end spinning and yarn conditioning machines.

**SECOND YEAR B. TEXT. – SEMESTER – II****4.6 FABRIC MANUFACTURING MACHINERY - IV (TPE)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives:**

1. To explain the construction and working of Projectile weaving machine
2. To explain the construction and working of Rapier weaving machine
3. To explain the construction and working of air jet and water jet weaving machine
4. To explain the construction and working of high speed shedding mechanisms

**1. SHUTTLELESS WEAVING:-**

Limitations of shuttle loom. Classification of shuttle less weaving machines.

Study of weft velocity curves for looms with different methods of weft insertion

**a) Projectile Weaving Machine** - History of shuttle less weaving machine; Machine drive, various motions timing, Mechanical and electronic rotary Dobby, Beat-up motion, Projectile picking , motion, picking phases, selvedge motion, Receiving unit, Let-off motion (Mechanical & power), Take-up motion, specifications of projectiles & grippers for various applications, Multi colour weft insertion, weft stop, warp stop, whip roller, weft brake etc.

**b) Rapier Weaving Machine** - Various models of rapier weaving machines and brief history. Classification of rapier weaving machine and their weft insertion principles. Concept of Dewas & Gabler rapier systems, their comparison. Study of effect of reed width on loom speed, their comparison. Study of rapier heads.

Rapier machine models, machine drive, Timings of various motions, beat up motion, Rapier motion drive details, Details of rapier tape, head, sely construction, guiding elements, Gripper openers, cutters, stroke adjustment. Selvedge forming elements & adjustments.

- c) Air Jet Weft Insertion** - Introduction, overview of weft insertion elements, main nozzle designs, relay nozzle designs, stretch nozzle design. Configurations, loom timing of picking elements and settings, constructional details of profile reed. Air supply and energy consumption, Air flow in nozzles and guide channel, performance of yarns in air jet insertion, Optimization of settings, Weft stops and breaks, application of air jet weaving. Drive and Pneumatic circuit for air supply. Technical features of modern air jet weaving machines, (Popular machine models) Quality of Air, Maintenance of machines.
- d) Water Jet Weft Insertion:** - Introduction, Design requirements, Picking mechanism, weft insertion elements, features of water jet looms, applications of water jet weft insertion system. Comparison with air jet, maintenance. Technical features of modern water jet weaving machines, (Popular models) Comparison of various shuttle less weaving technologies with respect to reed width, loom speed, WIR and capital cost.
- 2. HIGH SPEED SHEDDING MECHANISM :-**
- a.** Limitations of Tappet shedding motion, positive cam shedding concept and need, Positive cam shedding motions, details of construction and working (Ruti-C, Projectile, Rapier and Airjet), Adjustments essential during weave change and timing. Mounting possibilities, pitch of heald frames
- b.** Limitation of lever and cam negative dobbie, positive lever dobbie, positive rotary cam concept, Rotary mechanical and electronically controlled dobbie, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.
- c.** Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, adjustment for various weaves, Jacquard capacity, mounting, suitability for various end uses, data transfer and management, Networking with looms.

**List of Experiments:-**

- 1) General study of projectile machine and drive arrangements for various

motions.

- 2) Study of Sulzer picking motion and positive cam motions of Sulzer machine
- 3) General study of flexible Rapier machine, it's drive and control panel
- 4) General study of Air jet weaving machine, it's drive and control panel
- 5) General study of rigid Rapier machine, it's drive and control panel
- 6) Study of Rotary mechanical & electronic dobby.
- 7) Study of electronic jacquard mechanism.
- 8) Visit to Jacquard unit.
- 9) Visit to rapier weaving unit.
- 10) Overhauling of Sulzer picking motion.
- 11) Study of style change process on projectile, air jet and rapier weaving machines
- 12) Study of let-off motions of all shuttle less weaving machines and operations of looms.
- 13) Study of sample weaving equipments
- 14) Visit to Air jet weaving unit.
- 15) Visit to Projectile weaving unit
- 16) Study of Dobby CAD software and design creation

**Reference Books:-**

1. Modern Preparation & Weaving by A. Ormerod.
2. Textile Maths Vol.III by J.E. Booth
3. Principles of weaving by Marks & Robbinson.
4. Weaving machines & methods by Dr. Talukdar, Prof. D.B. Ajgaonkar.
5. Shuttleless weaving by Svaty.
6. Modern Methods of Weaving by Duxburry.
7. Hand Book of Weaving - Sulzer Publication.
8. Handbook of weaving – Sabit Adanur.
9. Shuttleless Looms – J. J. Vincent
10. Shuttleless weaving machine – O. Talavasele, V. Svaty

**Course Outcome**

Student will be able to:

1. Understand the construction and working of Projectile weaving machines

2. Understand the construction and working of Rapier weaving machines
3. Understand the construction and working of Air jet and Water jet weaving machines
4. Understand the construction and working of high speed shedding mechanisms

**SECOND YEAR B. TEXT. – SEMESTER – II****4.3 CHEMISTRY OF TEXTILE FIBRES - III (TC)**

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

**Course Objectives**

1. To describe the synthesis of various high-tech fibres.
2. To impart knowledge of the polymeric structures, fibre processing of high-tech fibres.
3. To give details about the physical and chemical properties of high-tech fibres and use of knowledge of fibres properties in wet processing of textiles
4. To explain various applications of fibres

**1. Carbon Fibre:-**

Precursors for carbon fibre. Preparation of carbon fibre from polyacrylonitrile. Preparation of carbon fibre from rayon and pitch. Carbon fibre from phenolic precursors. Structure of carbon fibre. Surface properties, mechanical properties and chemical properties of carbon fibre. Various applications of carbon fibre.

**2. Kevlar Fibre :-**

Introduction, raw materials, manufacture, structure and morphology. Physical and chemical properties of Kevlar fibre. Various applications of Kevlar fibre.

**3. Nomex Fibre :-**

Introduction, polymer preparation, fibre preparation of staple and continuous filament. Typical properties like colour, density, tensile properties, thermal properties, light stability, chemical resistance, flex and abrasion resistance, moisture region. Dimensional stability, Dyeability. Various end uses.

**4. Polyurathane Fibre :-**

Introduction, raw materials, manufacture, physical and chemical properties, various applications of polyurethane fibre.

**5. High Performance Polyimide Fibre :-**

Introduction, synthesis of aromatic polyimides, manufacture of polyimide fibre. Physical and chemical properties of polyimide. Various applications of polyimide fibre.

**6. Bio Fibre :-**

Introduction, raw material, manufacture, physical and chemical properties and end uses. Biodegradability of polylactic acid fibre and bamboo fibre.

**Reference Books:-**

1. High Technology Fibres Vol.-III Part-C, by Menachen Lewin & Jack Preston.
2. High Technology Fibres Vol.-III Part-D, by Menachen Lewin & Jack Preston.
3. High Technology Fibres Vol.-III Part-A, by Menachen Lewin & Jack Preston.
4. Carbon Fibres by Jean Baptiste Donnet & Roop Chand Bansal.
5. New Fibres by Philips & Hongu.
6. High Technology Fibres Vol.-III. Part B by Menachem Lewin & Jack Preston.
7. Kevlar Aramid Fibre by H.H. Yang.
8. Handbook of Fiber Chemistry – by Menachem Lewin & M. Pearce.

**Course Outcome**

- 1) Describe the synthesis of various high-tech fibres.
- 2) Explain the polymeric structures, fibre processing of high-tech fibres.
- 3) Enunciate physical and chemical properties of high-tech fibres and use knowledge of fibres properties in wet processing of textiles
- 4) Enlist various applications of fibres

**SECOND YEAR B. TEXT. – SEMESTER – II****4.4 CHEMISTRY OF DYES AND PIGMENTS (TC)**

Lectures	:	4 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

- 1 Introduce synthetic dye industry, intermediates and coal tar distillation  
Describe classification of dyes and pigments based on chemical structure and application; nomenclature
- 2 Discuss dye structure and important reactions of manufacturing of dyes such as nitro, azo, stilbene, DPM, TPM and anthraquinone chromophore base
- 3 Discuss structural aspects of dyes such as absorption of light, colour and chemical constitution, substantivity and fastness properties and recent development in reactive dyes
- 4 Describe elements of dyeing. Discuss classification, general method of dyeing and fastness properties of various dyes and acquaint the students with industrial working by organizing industrial visits.

**CHAPTER - 1 INTRODUCTION OF DYE**

- Introduction to synthetic dye industry.
- Importance of dye intermediates
- Destructive distillation of coal tar & its products and use of these products in dyestuff manufacturing.

**CHAPTER – 2 CLASSIFICATION OF DYE**

- Definition of dye & pigment.
- Classification of dyes according to the method of application.
- Classification of dyes according to the chemical structure.
- Colour index & its significance.
- Nomenclature of dyestuffs.



### **CHAPTER – 3 PIGMENTS**

- Pigments & their classifications based on colour.
- Pigments & their classifications based on chemical structure.

### **CHAPTER – 4: PREPARATION OF DYES BASED ON CHROMOPHORI GROUP**

- Structures of dye intermediates
- Nitro dyes
- Azo dyes
- Stilbene dyes
- DPM and TPM dyes
- Anthraquinone dyes

### **CHAPTER – 5 ASPECTS OF CHEMICAL STRUCTURE OF DYESTUFF**

- Factors governing absorption of light.
- Relationship between colour & chemical constitution.
- Relationship between chemical structure & substantivity.
- Relationship between chemical structure & fastness properties.

### **CHAPTER – 6: DEVELOPMENTS IN REACTIVE DYES**

Concepts of homofunctional and bifunctional reactive dyes, Chlorine and Fluorine based reactive dyes, low salt reactive dyes

### **CHAPTER – 7: ELEMENTS OF DYEING**

Concepts of percentage Shade, Affinity and Substantivity of dyes, Material to Liquor ratio, pH, Solubility, Dissolution of dyes, Exhausting agents, Retarding agents, Aggregates of dyes, Equilibrium factor, Time of dyeing, Temperature of dyeing, Compatability of dyes in combination shades, percentage Exhaustion, percentage Expression.

### **CHAPTER – 8: DYES FOR CELLULOSIC FIBRES**

#### **DIRECT DYE**

- Classification & general method of dyeing.
- Fastness properties of direct dyed goods.

### **REACTIVE DYE**

- Classification of dyes and general methods of dyeing.
- Fastness properties of reactive dyed goods.

### **VAT DYE**

- Classification vat dyes.
- Various steps involved in vat dyeing.
- Fastness properties of vat dyed goods.

### **SULPHUR DYE**

- Classification of sulphur dyes.
- General Method of dyeing.
- Fastness properties

### **AZOIC COLOURS**

- Mechanism of dyeing wrt preparation of naphthol & base solution & coupling.
- Problems associated wrt fastness properties.

## **CHAPTER- 9 : DYES FOR SYNTHETIC FIBRES**

### **DISPERSE DYE**

- General methods of Dyeing with disperse dye.
- Fastness properties of disperse dyed goods.

### **ACID DYE -**

- Classification & mechanism of dyeing of Nylon, wool and silk with acid dye.
- Fastness properties of acid dyed material.

### **BASIC DYES -**

- General method of Dyeing of acrylics, nylon and cotton with basic dye.
- Fastness properties of basic dyed goods.

### **List of Experiments:-**

1. Estimation of aniline by diazotitration method
2. Estimation of aniline by diazotitration method
3. Identification of dyes
4. Identification of dyes
5. Identification of dyes on fibre
6. Identification of dyes on fibres

7. Comparative estimation of strength of the given dye by dyeing technique
8. Comparative estimation of strength of the given dye by dyeing technique
9. Comparative estimation of strength of the given dye by Optical technique
10. Compatibility of dyes in compound shades
11. Dyeing of cotton with direct dyes with differential MLR
12. Dyeing of cotton with reactive dyes with differential concentration of salt
13. Dyeing of cotton azoic colours
14. Dyeing of cotton with vat dye
15. Dyeing of nylon / wool / silk by acid dyes
16. Study and comparison of exhaust and padding methods of dyeing

**Reference Books :**

1. Synthetic organic chemistry by G.R. Chatwal.
2. Synthetic dyes by K. Venkatraman
3. Chemistry of dyes and principles of dyeing by Dr. V.A. Shenai
4. Principles of dye chemistry by Paul Vittum.
5. Synthetics Dyes by K.M. Shah
6. Dyeing & chemical technology of textile fibres by E.R. Trotman.
7. The dyeing of cellulose fibres by Clifford Preston
8. Chemical technology of fibrous material by F.Sadov
9. Technology of dyeing by Dr. V.A. Shenai
10. Chemical processing of synthetic fibres by Dr. K.V. Datye & A.A. Vaidya

**Course Outcome**

Student should be able to

1. Recognize importance of synthetic dyes and intermediates used thereof; and destructive distillation of raw source of intermediate - coal tar; Illustrate the classification of dyes and pigments according to application methods and chemical structure. Describe the use of colour index and nomenclature of dyes.
2. Illustrate general dye and intermediate structure and explain the preparation of dyes based on chromophoric groups like Nitro, Azo, Stilbene, anthraquinone, DPM & TPM

- 3 Explain the relationship between chemical structure of dyes and various properties like colour developed, substantively, fastness etc., developments in reactive dyes
- 4 Visualize elements of dyeing; understand sub classification, steps involved in dyeing and fastness properties of textile material dyed with various dyes like Direct, Reactives, Vat, Sulphur, Acid, Basic, Disperse dyes, Demonstrate the identification of dyes in powder form and on dyed fibre; evaluate the strength by dyeing method

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.5 WEAVING AND KNITTING TECHNOLOGY (TC)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

1. To discuss the basics of fabric forming.
2. To discuss objects, working and calculations of various weaving processes such as winding, pirn winding, warping, sizing, drawing in, and weaving machines (plain, auto and shuttleless).
3. To describe the method of fabric forming by warp knitting and weft knitting, fabric structure and calculations
4. To describe method of interlacement for warp and weft for different weaves such as plain, twill, satin, honeycomb, huck-a-back and mock-leno

1. General: Methods of fabric forming such as weaving, knitting and non-wovens. Brief general discussion about processes involved in these methods. Basic terms like Warp, Weft, End, Pick, Selvedges

2. Process Flow chart for grey, striped and checks fabrics

3. Warp Preparation – Object and passage of yarn through Winding machine, Functions of various important parts like creel, tensioner, clearer, winding drum. Features of automatic winding machine.

Objects and passage of yarn through Beam Warping Machine. Objects and need of Sectional Warping Machine. Process of sectional warping and Beaming.

Objects and need of Sizing, Passage of warp through Sizing machine, Functions of various important parts like creel, sow box, drying system, and head stock. Objects of drawing in and denting process.

4. Weft Preparation : Objects of Pirn winding machine and passage of yarn through machine

5. Fabric Forming –

i) Weaving – Classification of looms. Concept of weaving. Passage of warp through the plain loom. Driving arrangement of plain loom and speed relation of crankshaft, bottom shaft and picks introduced. Various motions used on loom.

Shedding – Different types of shedding mechanisms like tappet, dobby and jacquard. Concept of negative and positive shedding, working of tappet shedding mechanism.

Limitations of tappet shedding

Picking – Objects, types and working of Overpick & Underpick mechanism.

Beat Up – Objects, construction and working of beat up motion. Eccentricity of sley. Functions of reed, Reed count.

Secondary Motions - Objects, construction and working of Negative Let off, Seven Wheel Take Up motion

Auxiliary Motions - Objects, construction and working of Weft Stop Motion, Warp protecting motion, Temple, Brake, backrest.

Functions and applications of Climax Dobby, 4x1 Drop box and principle of Jacquard. Limitations of Shuttle Loom. Features of Automatic Loom, Principles of picking of Projectile, Rapier, Air Jet and Water Jet.

ii) Knitting – Comparison of Knitting with Weaving. Structure of single jersey, Rib & Interlock fabrics. Representation of structure on point paper. Types of stitches and their functions. Knitting cycle for weft knitting. Structure of Warp Knitted fabric and its applications.

6. Fabric Structure – Introduction to interlacement of threads, methods of representation of warp weft interlacement on graph paper. Design, draft, peg plan and denting order of plain, twill and satin weaves. Derivatives of plain weave, Towel weaves like Honey comb, Huck a back & Mock leno. Quality particulars of Saree, Dhoti, Poplin, Cambric, Denim, Suiting and Shirting fabrics.

7. Calculations – i) Production calculation for winding, warping, loom and circular weft knitting machine ii) Fabric weight of woven and knitted fabrics

**List of Experiments:**

- 1) General study of Automatic drum winding and Pirn winding m/cs.
- 2) General study of warping & sizing m/c (Visit )
- 3) Passage of warp through the ordinary & automatic looms.
- 4) General study of the primary motions and secondary motions on loom
- 5) Study of auxiliary motions.
- 6) General study of dobby (climax).
- 7) Study of Jacquard shedding mechanism
- 8) Study of Drop box motion
- 9) General study of features of Automatic looms (Cimmco & Ruti).
- 10) Study of picking mechanism on projectile, rapier & air jet looms.
- 11) General study of circular weft knitting machine.
- 12) Fabric Analysis: - Woven fabrics samples (plain, twill based samples)
- 13) Fabric Analysis: - Woven fabrics samples (satin based samples)
- 14) Weft Knitted Fabric's analysis
- 15) Visit to Plain and automatic loom units
- 16) Visit to Shuttleless weaving machines unit

**Reference Books:**

1. Plain loom motions by K.T. Aswani
2. Winding & Warping by Dr. M.K. Talukdar.
3. Fancy Weaving by K.T. Aswani.
4. Textile Design & Colour by Watson.
5. Knitting Technology by Ambumani.
6. Woven Fabric production – I, and II, NCUTE publicatiopn.
7. Knitting by Prof. D.B. Ajgaonkar.
8. Sizing by D. B. Ajgaokar

**Course Outcome**

Students will be able to:

1. Understand basics of fabric forming.
2. Understand objects, working and calculations of various weaving processes such as winding, pirn winding, warping, sizing, drawing in, and weaving machines (plain, auto and shuttleless).

3. Understand the method of fabric forming by warp knitting and weft knitting, fabric structure and calculations
4. Understand method of interlacement for warp and weft for different weaves such as plain, twill, satin, honeycomb, huck-a-back and mock-leno



**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.6 TECHNOLOGY OF PRETREATMENTS - II (TC)**

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

**Course Objectives**

1. To describe the chemical preparatory processes for knit goods & protein fibres.
2. To discuss various factors to be considered & precautions taken while processing synthetics and speciality fabrics.
3. To discuss various preparatory processing steps for terry towel and denim fabrics.
4. To understand the significance of bio technology & mercerization in preparatory processing and acquaint the students with industrial working by organizing industrial visits.

**CHAPTER – 1 PREPARATORY PROCESS FOR KNIT GOODS**

Types of knitted fabrics, process sequence, singeing of knit goods, precautions to be taken while processing of knit goods, Practical problems and remedies in knit processing.

**CHAPTER – 2 PREPARATORY PROCESSES FOR PROTEIN FIBRES**

Preparatory process sequence for worsted and woolen goods, objects of crabbing and felting, Preparatory process sequence for silk goods, Various methods of Degumming of silk, scouring and bleaching of silk and wool, precautions to be taken while processing protein fibres, Practical problems and remedies.

**CHAPTER – 3 PREPARATORY PROCESSES FOR SYNTHETICS & BLENDS**

Process sequence for P/C, P/V, P/W and synthetic goods, objects of heat setting, details of preparatory processes for PET, Nylon, Acrylic and its blends, Practical problems and remedies.

#### **CHAPTER –4 PREPARATORY PROCESSES FOR SPECIALITY FABRICS**

Preparatory process sequence for Spandex containing goods, Preparation of linen and its blends, Preparatory process for coloured woven goods, Preparatory process for lignocellulosic fibres like Jute, Practical problems and remedies.

#### **CHAPTER – 5: PREPARATORY PROCESSES FOR TERRY TOWEL & DENIM**

Detailed study of preparatory process sequence for terry towels and denim goods, causticization of terry towels, working principle of machines used, Practical problems and remedies.

#### **CHAPTER –6: BIO TECHNOLOGY IN PREPARATORY PROCESSES**

Advantages of enzymes in processing, Detailed study of types of enzymes used in preparatory processes, their mechanism of action, properties. Deactivation of enzymes.

#### **CHAPTER–7: MERCERIZATION, UNCONVENTIONAL MERCERIZING & MACHINES**

Overview of mercerizing process, Concept of Hydrate formation & various types of cellulose conversions, Various stages of mercerization & their comparison, Detailed study of yarn and fabric mercerization machines, features of pad chain, pad chainless and padless chainless mercerization machines, wet on wet mercerization, Mercerisation of P/C blends, Knit goods mercerization m/c in tubular and open width form, Study of hot mercerization, Study of liquid ammonia mercerization and machines, practical problems and remedies, Evaluation to test efficiency of mercerization.

#### **CHAPTER-8 : MACHINERY FOR PREPARATORY PROCESSES**

Study of soft flow, over flow and air flow machines, Batch wise, semi-continuous & continuous machinery for preparatory process, Study of modern jiggers, pad batch stations and continuous bleaching range. Importance of utilities like steam, electricity, air and water in preparatory process & their norms, practical ways to minimize water and energy consumption in preparatory processes.

**List of Experiments:-**

- 1) Bio scouring and bleaching of cotton knitted fabric.
- 2) Combined Scouring & Bleaching of Cotton fabric.
- 3) Degumming & bleaching of silk.
- 4) Scouring & bleaching of wool.
- 5) Causticisation of Cotton yarn for terry towels.
- 6) Preparation of PET & PET/Cotton blended fabrics & its evaluation.
- 7) Preparation of cotton linen blend & its evaluation.
- 8) Preparation of cotton lycra blend & its evaluation.
- 9) Woollenisation of Jute.
- 10) Bleaching of Jute.
- 11) Enzymatic desizing of denim garments using garment washing machine.
- 12) Mercerization of cotton fabric & determination of Barium activity number.
- 13) Hot mercerization of cotton fabric & determination of Barium activity number.
- 14) Slack mercerization of cotton fabric & evaluation of absorbency and extensibility of treated sample.
- 15) Visit to a modern process house.  
(Study of machinery, process sequences & consumption of various utilities.)

**Reference Books:-**

1. Chemical technology in the pre treatment processes of textiles by S R karmakar, Elsevier publication.
2. Chemical processing of silk and wool by M L Gulrajani
3. Chemical Processing of Polyester / Cellulosic blends by R.M.Mittal & S.S. Trivedi.
4. Chemical processing of synthetic & blends by Dr..K.V. Datye & A.A. Vaidya.
5. Mercerizing by J.T. Marsh.
6. Dyeing & Chemical Technology of Textile Fibres by E.R. Trotman.
7. Textile preparation and dyeing Asim kumar roy choudhari published by SDC (I)
8. Chemical processing machinery by R S Bhagwat.

**Course outcome**

1. Students will be able to decide preparatory process sequence for knit goods and protein fibres.
2. Students will be able to understand the various factors to be considered while processing synthetic and specialty fabrics.
3. Students will be able to understand processing of terry towel and denim.
4. Students will be able to understand significance of bio technology & explain process of mercerization, machinery used.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.1 YARNS AND FABRICS FOR FASHION APPLICATIONS (FT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Subject Total	:	150 Marks

**Course objective**

1. To explain the types and structure of fancy yarns.
2. To explain fancy yarn manufacturing techniques.
3. To explain principles of jet weft insertion and continuous weft insertion.
4. To explain the techno-economics of different shuttleless weaving and fabric inspection methods.

**Unit-1: Fancy yarns -**

Various types of fancy yarns - manufacturing techniques and structure - Slub yarn, multi twist multi count yarn, Crep yarn, multi component fancy yarn, Rotor and Ring frame slub yarn, Blended Fancy yarns, SIRO, Bobtex etc.

**Unit-2: Hosiery Yarns -**

Requirements of hosiery yarn. Raw materials, Process sequence & parameters. Hosiery yarn form Cotton, Polyester, viscose & their blends. Properties and applications of hosiery yarns.

**Unit-3:Elastane Yarns -**

Introduction to elastane textile material like polyurethane, production of core / cover lycra yarns on ring spinning & air covering machine. Necessary modification on machine, process parameters, yarn properties & end uses.

**Unit-4: Sewing Threads and Embroidery Yarn -**

Introduction of Thread construction, Characteristics and production methods of sewing threads, Types of thread package, Thread storage & degradation. Introduction of thread construction, Raw material used, Characteristics of

embroidery yarn, Thread production methods and types of thread package

#### **Unit-5: Jet Weft Insertion**

Principles of Airjet weft insertion from single nozzle, confusor and multi nozzle airjet weaving machines and their elements, Take up, let off and Auxiliary motions.

Waterjet weft insertion system, Water consumption, quality and its requirement.

Field of applications, commercial viability of Airjet and Waterjet weaving machines.

Techno-economical ratings of different shuttleless technologies.

#### **Unit-6: Multiphase, Circular and Tri-axial weaving**

Principle of Multiphase weaving, Passage of yarn, Study of Sulzer M8300 multiphase weaving machine, Field of applications.

Principle of Circular weaving, Passage of yarn, Classification, Yarns used and field of applications.

Principle of Tri-axial weaving, Properties and applications of tri-axial fabric, Yarns used.

#### **Unit-7: Sample weaving and Fabric inspection**

Concept of sample weaving from handloom to Suzuki sample loom, Weaving of different materials on shuttleless weaving like Polyester, Silk, Acrylic, Polypropylene, Nylon and blends.

Importance of fabric inspection, Different fabric inspection systems.

#### **List of Experiments:**

1. Manufacturing of Hosiery yarn and warp yarn on the ring spinning machine.
2. Manufacturing of elastic core cover yarn on ring frame.
3. Manufacturing of air covered fancy yarn on air covering machine.
4. Manufacturing of dye package by using precision winding machine.
5. Manufacturing of fancy yarns on hallow spindle winder by changing machine parameters.
6. Manufacturing slub yarn, multi count yarn & multi twist yarn.
7. Manufacturing of fancy yarn using SIRO spinning.

8. Mill visit to the fancy yarn manufacturing unit.
9. General study of Airjet weaving machine.
10. Weaving on Airjet loom by changing parameters.
11. Sample warping and weaving by blend yarns.
12. Fabric inspection procedures.
13. Visit to Airjet weaving unit.
14. Visit to Circular weaving unit.
15. Visit to shuttleless weaving unit for fabric inspection and its importance.
16. Fabric defects and remedies in Shuttleless weaving.

**Reference books:**

1. Fancy yarns by Wood head publications.
2. 'Modern Yarns for Modern Fabrics Seminar' Conference proceedings. By TTI, The Textile Inst. Publisher.
3. Yarns & Fabric Classification Main Items in wool and blends, Italtex Editor.
4. Textile guide synthesis to create yarns & fabrics, Italtex Editor
5. 'Sewing Threads' Textile progress vol.30 no.3/4, by J.O. Ukponmwan, The Textile Inst. Publisher.
6. "Modern preparation and weaving" By A. Ormerod
7. "Weaving machines, mechanism, management" By Talukdar, Ajagaokar Sriramulu
8. "Shuttleless weaving" By Talav and Svaty
9. "Modern developments in weaving Machinery" By Duxbury
- 10 "Shuttleless weaving" by NCUTE programme by IITDelhi.
11. Brouchers and Machine pamphlets of various machine manufacturers
12. "Airjet weft Insertion" By L. Vangheluwe, Textile Progress

**Course outcome:**

Students will able to-

1. Illustrate the types and structure of fancy yarns.
2. Understand the fancy yarn manufacturing techniques.
3. Understand the weft insertion in Airjet, Waterjet, Circular, Multiphase and Tri-axial looms.
4. Understand the sample weaving process and fabric inspection systems.

**SECOND YEAR B. TEXT. – SEMESTER – II****4.3 CHEMICAL PROCESSING OF TEXTILES (FT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

1. To describe the objects of sizing and preparatory processes.
2. To describe the process sequence for processing of various types of fibres.
3. To explain the role of different chemicals used in preparatory processes.
4. To explain the objectives and effects of mercerization on cellulose and acquaint the students with industrial working by organizing industrial visits.

**CHAPTER – 1 SIZING**

Objects of sizing, Size paste ingredients with their functions, Classification of adhesives Introduction of natural, modified and synthetic adhesives. Size paste formulation for various types of yarn. Concept of size pick up, % add on, it's importance in weaving.

**CHAPTER – 2 GREY INSPECTION**

Importance of grey inspection, Four point & ten point system & numerical for acceptance & rejection of fabrics, Defect analysis, Types of stitches, Inspection machines for woven and knit goods

**CHAPTER – 3 PRETREATMENTS**

Introduction of pretreatments in wet processing. Various pretreatment sequences for yarn, woven, Knits, synthetics & their blends, Working of shearing and cropping machine, Objects of singeing. Working of Gas singeing machine. Gas singeing of woven & knitted fabrics.

**CHAPTER – 4 DESIZING**

Objects, Mechanism, methods and classification of desizing. Desizing of Cotton, P/C and Polyester fabrics, Evaluation of efficiency of desizing, Degumming of silk.



## **CHAPTER – 5 SCOURING**

Importance of scouring, Concept of alkaline scouring, solvent scouring and bio scouring, Study of batch-wise & continuous methods of scouring, Scouring of cotton, blends and synthetic fabrics, Evaluation of efficiency of scouring.

## **CHAPTER – 6 BLEACHING**

Objects of bleaching. Introduction to bleaching agents like sodium hypochlorite, hydrogen peroxide, sodium perborate and potassium permanganate. Bleaching of cotton, blends and synthetics, Batch & continuous machinery for bleaching of substrate in different forms, Bleaching of wool, silk, Concept of AOX, Evaluation of bleaching efficiency.

## **CHAPTER – 7 MERCERIZATION**

Importance of mercerization in cotton processing, Effect of mercerization on structure of cellulose. Study of machinery used for mercerization of yarn, woven and knit fabrics. Effect of various parameters on mercerization efficiency, Concept of hot mercerization & liquid ammonia treatment, Evaluation of mercerization efficiency using barium activity number.

### **List of Experiments:-**

- 1) Testing of adhesives used in sizing.
- 2) Testing of softener used in sizing.
- 3) Testing of wetting agents used in preparatory processes.
- 4) Acid and enzymatic desizing of Cotton fabrics.
- 5) Batch wise alkaline scouring of cotton fabric and *PIC* blend.
- 6) Semi continuous scouring of cotton fabrics.
- 7) Bio scouring of Cotton knitted fabrics.
- 8) Hypochlorite bleaching of Cotton fabrics.
- 9) Peroxide bleaching of Cotton fabrics.
- 10) Mercerization of cotton hank.
- 11) Determination of mercerization efficiency by BAN method.
- 12) Degumming of silk.
- 13) Scouring & bleaching of wool.
- 14) Determination of whiteness index, yellowness index of bleached & OBA treated fabrics by using CCM.

- 15) Visit to sizing unit and process house.

**Reference Books:-**

1. Sizing by Prof.D.B. Ajgaonkar, M.K. Talukdar & V.R. Wadekar.
2. Chemical processing of textiles, NCUTE publication. .
3. Chemical Processing of Polyester/Cellulosic blends by R.M.Mittal & S.S. Trivedi.
4. Mercerizing by J.T. Marsh.
5. Introduction to Textile bleaching by J.T. Marsh.
6. Bleaching, Dyeing & Chemical Technology of textile fibres by E.R. Trotman.
7. Technology of Bleaching by V.A. Shenai.
8. Chemistry and technology of fabric preparation and finishing by Dr. C. Tomasino, NCSU, USA.

**Course Outcome**

- 1) Student will be able to illustrate the importance of sizing and pretreatments.
- 2) Student will be able to describe process sequence for processing of various fibres.
- 3) Student will be able to understand objectives, mechanism and classification of mechanical and chemical preparatory processes.
- 4) Student will be able to judge the changes that take place in textiles during mercerization.

**SECOND YEAR B. TEXT. – SEMESTER – II****4.4 PATTERN ENGINEERING - II (FT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

**Course Objectives**

1. To explain various style lines used in patterning.
  2. To explain various garment components and stitching procedure for it.
  3. To teach grading process and quality of garments
  4. To explain fundamentals of draping and demonstrate draping procedure for basic blocks.
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1. **Stylelines** – Introduction to style lines, The Classic Princess Style line, Armhole Princess Style line, The Panel Styleline
  2. **Cowls** – Introduction to Cowls, Types of cowls, Preparing patterns for Back Cowls, Armhole Cowls, Pleated Cowls, Exaggerated Cowls, Inset Cowls
  3. **Skirts/Circles and Cascades** – Types of skirts, skirt lengths, Drafting of flared skirts, gored skirts, godets, wrap skirts, circles, peplums and cascades, skirts with uneven hemlines
  4. **Dresses without Waistline Seams**- torso foundation, dress categories, three basic dress foundations, styleline foundation, pattern making problems.
  5. **Grading** – Introduction to grading, General principles, Grade Rules, Zero Point and Cardinal Points, Methods of grading: Track grading and nested grading, Grading the basic block and basic skirt, grading of sleeves and collars
  6. **Draping** – Preparation of fabric for draping, Elements of fabrics, Principles and fitting methods, Basic Bodice draping, basic skirt draping, draping of sleeves and collars
  7. **Pattern Quality Analysis** – Relationship between pattern making and quality of the garment, Factors affecting pattern quality, Introduction to computerized

pattern making, computerized grading, study of available software for pattern making

8. **Sewing of elementary parts** – Darts: tapering to fit the garments, tucks and pleats, waistbands, collars, facings, attaching sleeves to the basic bodice
9. **Advanced Sewing** – Sewing of off-shoulder designs, collars with stand, cowls sewing, sewing skirts, circles and cascades

**List of Experiments:-**

1. Draft and stitch pattern for classic princess style line using two-dart basic block pattern
2. Draft and stitch pattern for armhole princess style line using two-dart basic block pattern
3. Draft and stitch pattern for pleated shoulder cowl using the basic front pattern block
4. Draft and stitch pattern for back cowl using the basic back pattern block
5. Draft and stitch pattern for armhole cowls.
6. Draft and stitch pattern for flared skirt
7. Draft and stitch pattern for 6-gore flared skirt.
8. Draft and stitch pattern for godets.
9. Draft and stitch pattern for wrap skirt.
10. Draft torso foundation for dresses without waist line seam.
11. Grade a basic block of size 8 to size 6, 10, 12 and 14 using nested grading.
12. Grade a skirt of size 12 to size 6, 8, 10 and 14 using track grading.
13. Prepare muslin fabric for draping and drape a basic bodice on the body form.
14. Prepare muslin fabric for draping and drape any skirt on the body form.
15. Prepare muslin fabric for draping and drape shawl collar on the body form.
16. Prepare muslin fabric for draping and drape convertible collar on the body form

**Reference Books:-**

1. Pattern making for fashion design, Helen Joseph Armstrong, Pearson Education, ISBN: 81-378-0938-8
2. Pattern Grading for Women's Clothes, Gary Cooklin, Blackwell Publishing, ISBN: 978-81-265-2281-1

3. The Art of Fashion Draping, Amaden Crawford, Fairchild Books, ISBN: 81-8710-735-9
4. Professional Sewing Techniques for Designers, Julie Cole and Sharon Czachor, Fairchild Books, ISBN:978-1-56367-516-4
5. Ultimate Sewing Bible, Marie Clayton, Collins and Brown, ISBN: 978-1-84340-411-8
6. Apparel Manufacturing Handbook, Jacob Solinger, Bobbin Media Corp.

**Course Outcome**

1. Recognize various style lines and their aesthetical values in garments.
2. Describe various garments/components and their construction.
3. Apply grading procedure for various basic blocks and use patterning principles to correct pattern defects.
4. Demonstrate draping procedure for various basic blocks.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.5 TESTING OF TEXTILES AND APPARELS (FT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives**

1. To discuss significance of fabric and apparel properties.
2. To discuss the factors affecting fabric and apparel properties.
3. To explain principle and testing methodology of fabric properties.
4. To explain principle and testing methodology of apparels and accessories.

**1. Classification of fabric Properties, Sampling of Fabrics**

**2. Dimensional characteristics**

Length, Width, Thickness, EPI and PPI, Thread count, Fabric weight - Weight per unit length, Weight per unit area, Crimp of yarn in fabric, Effect of crimp on the fabric properties, Measurement of crimp, Fractional cover factor, Cloth cover factor.

**3. Mechanical Properties of Fabric**

**A. Fabric Strength**

Terminology and definitions. Tensile strength testing – Ravelled strip test, Cut strip test, Grab test, comparison of strip test & grab test, Fabric assistance, Tear strength testing – Elmendorf tearing strength tester, Impact principle - Ballistic test, Bursting strength test.

**B. Abrasion Resistance of Fabric**

Serviceability, wear, abrasion, assessment of abrasion damage, BFT abrasion testing machine, Martindale abrasion tester.

**C. Pilling of Fabrics**

Definition, Mechanism of pilling, Factors responsible for pilling, ICI Pill Box Tester.

#### **4. Aesthetic Properties of Fabric**

##### **A. Fabric Handle, Stiffness, Drape**

Concept - fabric hand, Objective & subjective evaluation of textiles, Measurement of Stiffness - Shirley stiffness tester, Heart-loop test, Measurement of drape - Drape meter,

##### **B. Crease Resistance & Crease Recovery**

Definitions: Crease, Wrinkle. Measurement of crease recovery - Recovery angle, TBL method.

##### **C. Luster**

Concept of luster, Subjective aspects of luster, measurement of luster, Effect of fabric construction on luster.

#### **5. Comfort Properties of Fabric**

##### **A. Air Permeability**

Definitions - Air permeability, Air resistance, Air porosity, Shirley air permeability tester.

##### **B. Water-Fabric Relations**

Water permeability and Water repellency, Basic concepts of Wetting and Water repellency, Methods of measuring water repellency in fabrics – Wetting time test, Spray test, Drop penetration test, Hydrostatic head test., Water vapour transmission: Concept and measurement.

#### **6. Apparel Testing**

- i) Assessment of fabric quality for apparels - KAWABATA & FAST techniques.
- ii) Dimensional properties of apparel fabrics: Relaxation shrinkage, Felting shrinkage, Swelling shrinkage, Contraction, Snagging.
- iii) Sewability of fabrics: Seam strength, Seam efficiency, Seam pucker, Seam slippage, Needle cutting / Yarn severance, Seam appearance,
- iv) Bow and Skewness
- v) Testing of Accessories: Fusible interlinings, Zippers, Elastic waistband, Sewing threads, Buttons.

**List of experiments:-**

1. Determination of fabric tensile strength and elongation.
2. Determination of fabric ballistic strength.
3. Measurement of fabric stretch-ability and recovery.
4. Determination of fabric bursting strength.
5. Determination of fabric tear strength.
6. Assessment of abrasion resistance.
7. Assessment of fabric performance in flex abrasion.
8. Assessment of pilling propensity.
9. Determination of fabric crease recovery angle.
10. Determination of fabric stiffness.
11. Determination of fabric drape.
12. Measurement of air permeability of fabric.
13. Assessment of water repellency by spray rating test.
14. Seam strength testing.
15. Dimensional stability of woven and knitted fabrics.
16. Testing of zippers.

**Reference Books:-**

1. Principles of Textile Testing, J.E.Booth, CBS Publishers & Distributors, 1996.
2. "Hand book of Textile Testing", Sundaram V, CTRL Publication, Bombay.
3. An Introduction to Quality Control for Apparel Industry, Pradip Mehta.
4. Managing Quality in the Apparel Industry, New age international (P), Ltd. Publishers, Pradip Mehta & Satish Bhardwaj.
5. Quality Control and Testing, V.K.Kothari.

**Course Outcome:**

Student will be able to,

1. Understand significance of fabric and apparel properties.
2. Discuss the factors affecting fabric and apparel properties.
3. Test fabric properties and interpret results.
4. Test apparels and accessories and interpret results.



**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.6 FASHION ILLUSTRATION (FT)**

Lectures	:	2 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

**Course Objectives:**

1. To discuss basic figure proportions and draw fashion figures.
2. To explain various types of fabrics and garments with appropriate rendering technique.
3. To discuss flats and specs for women, men, and children.
4. To explain composition, space and shapes for layout.

**1. Figure Proportions**

Real Figure versus fashion figure, Understanding basic proportions of 8 head theory and 10 Head Theory, Figure mapping with geometrical shapes, Fleshing out, Profile figure, Three-quarter turned figure.

**2. Basic Figure Forms**

Full front head, profile head, three-quarter turned head, Hairstyles, Facial features: eyes, nose, mouth and ears. Drawing legs, Legs in motion, Foreshortening legs, Drawing feet, Drawing Arms, Foreshortening arms, Rotating arms and legs, Drawing hands.

**3. Turning Reality to Fashion Fantasy**

Drawing from photographs, Gesture components, balance line, movement and balance, importance of center front, angles. Matching poses to garments, wide silhouettes, attitude in poses, attitude contradictions, illustrator versus designer, stylization

**4. Drawing Men**

Proportions of male figure, male versus female figure, drawing male figures, Drawing head, legs, arms and hands, hairstyle, comparing male and female gestures, Gesture sketching.

### **5. Drawing Children**

Children's age groups, Infants, Toddlers, Child, Tween, Head, Hairstyles, Arms and Hands, Legs and Feet, styling kids.

### **6. Rendering Techniques**

Art kit used for rendering, Rendering skin flesh tone, Patterns, Print, shading, Rendering materials like denim, chiffon, satin, taffeta, gouache, gauze, net, velvet, knits, fur, silk, wool, etc. rendering black garments, rendering hairs, Rendering accessories like hats, shoes, scarves, bags, belts, gloves, sunglasses, etc.

### **7. Drawing Flats**

Ways to layout flats, sketching flats freehand, proportions for flats, flats and specs, flats for men, flats for children, sketching techniques for flats, croquis mixed with flats.

### **8. Layout**

Composition for layout, figures and accessories, space and shapes in layout, grouping figures, layout choices.

### **List of Experiments: -**

1. Drawing of 8 head, 10 head and 12 head female fashion figure.
2. Drawing of male fashion figure.
3. Drawing fashion figures from photographs.
4. Dressing fashion figures.
5. Study of skin tone rendering.
6. Study of rendering denim tops and trousers.
7. Study of rendering satin, chiffon and georgette.
8. Study of rendering stripes, checks and animal patterns.
9. Study of rendering knits, nets, fur and wool.

10. Study of rendering accessories.
11. Illustrating of fashion figures using bitmap software.
12. Illustrating of fashion figures using vector software.
13. Study of rendering fabrics and garments using bitmap software.
14. Study of rendering fabrics and garments using vector software.
15. Study of drawing flats and specs.
16. Study of composition for layout.

**Reference Books:-**

1. Fashion Sketchbook by Bina Abling
2. Figure Drawing for Fashion Figure by Elisabetta Drudi
3. Fabric Texture and Patterns by Elisabetta Drudi
4. Illustrating Fashion by Kathryn McKelvey
5. Fashion Drawing: The basic principles by Anne Allen and Julian Seaman
6. Illustrating Fashion: Concept to Creation by Steven Stipelman
7. Fashion Artist: Drawing Techniques to Portfolio Presentation by Sandra Burke
8. Fashion Design Drawing and Presentation by Patrick John
9. Fashion Design Illustration (Women) by Patrick John
10. Fashion Design Illustration (Men) by Patrick John
11. Fashion Design Illustration (Children) by Patrick John

**Course Outcomes:**

1. Understand basic figure proportions and draw fashion figures.
2. Draw various types of fabrics and garments with appropriate rendering technique.
3. Draw flats and specs for women, men, and children.
4. Appraise composition, space and shapes for layout.

**SECOND YEAR B. TEXT. – SEMESTER – II**

**4.7 TEXTILE DESIGN AND COLOUR (FT)**

Practical	:	2 Hours / Week
Term Work	:	50 Marks
Subject Total	:	50 Marks

**Course Objective**

1. To illustrate various elements and principles of design.
2. To develop designs and motifs for various fabrics.
3. To draw different silhouettes and garment components
4. To understand use of computer for design development.

**List of Experiments**

1. Study of basic Drawing Tools and Techniques.
2. Motif development for fabric- natural, stylized, geometric and abstract.
3. Garment design development - structural, decorative and functional.
4. To develop colour wheel.
5. To study light theory of colour and its applications in fashion design
6. To study pigment theory of colour and its applications in fashion design
7. Illustrate various color harmonies and apply it on garment.
8. Develop designs/ motifs with the help of designing principles and illustrate each principle on croqui.
9. To study development of stripes and checks.
10. To produce stripes and checks design.
11. To study development of extra warp and extra weft fabric.
12. To compose all over design based on different phases.
13. Drawing different Silhouettes and garment components.
14. Study to use computer aided designs.
15. To study the textile 3D studio.
16. To study dobby design software.

**Reference Books:**

1. "Design Studies" by Manmeet Sodhia, Kalyani Publishers, New Delhi
2. "Textile design and colour- Elementary weaves and figured fabrics", William Watson.

3. "Fabric structure and design"- N. Gokarneshan.
4. "Woven Structures and Design "-Doris Goerner.
5. "Handbook of textile design- principles, processes and practice" - Jacquie Wilson, The Textile Institute, Wood head Publishing Limited.
6. "Encyclopedia of clothing and fashion- Vol-1,Vol-2,Vol-3" – Christopher Beward, Charles scribner sons.

**Course Outcome**

1. Understand various elements and principles of design
2. Develop designs and motifs for various fabrics
3. Draw different silhouettes and garment components
4. Understand use of computer for design development.

**D.K.T.E.SOCIETY'S TEXTILE & ENGINEERING INSTITUTE, ICHALKARANJI.**

**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- T.T. (TEXTILE TECHNOLOGY) Sem – I**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC/FT	Advanced Computer Programming	I	TT/MM/TP/TC	Thermal & Air Engineering	I
2	TT/MM/TP/TC/FT	Textile Mathematics–III	I	TT/MM/TP/TC/FT	Textile Mathematics–III	I
3	TT	Technology of Fibres other than Cotton	I	TT	Technology of Fibres other than Cotton	I
4	TT	Physical Properties of Textile Fibres	I	TT	Textile Testing-I	I
5	TT	Yarn Forming Technology-II	I	TT	Yarn Forming Technology-III	I
6	TT	Fabric Forming Technology-II	I	TT	Fabric Forming Technology-III	I

**D.K.T.E.SOCIETY'S TEXTILE & ENGINEERING INSTITUTE, ICHALKARANJI.**

**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- T.T. (TEXTILE TECHNOLOGY) Sem – II**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC	Thermal & Air Engineering	II	TT/MM/TP/TC/FT	Textile Electronics-I	II
2	TT/MM/TP/TC/FT	Textile Mathematics-IV	II	TT/MM/TP/TC/FT	Textile Mathematics-IV	II
3	TT	Physical Properties of Yarns & Fabrics	II	TT	Textile Testing-II	II
4	TT/MM	Chemical Processing of Textiles-I	II	TT/MM	Chemical Processing of Textiles-I	II
5	TT	Yarn Forming Technology-III	II	TT	Yarn Forming Technology-IV	II
6	TT	Fabric Forming Technology-III	II	TT	Fabric Forming Technology-IV	II
7	TT/MM	Textile Design & Colour	II	TT/MM	Textile Design & Colour	I

**D.K.T.E.SOCIETY'S TEXTILE & ENGINEERING INSTITUTE, ICHALKARANJI.**

**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- M.M.T.T. (MAN MADE TEXTILE TECHNOLOGY) Sem – I**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC/FT	Advanced Computer Programming	I	TT/MM/TP/TC	Thermal & Air Engineering	I
2	TT/MM/TP/TC/FT	Textile Mathematics-III	I	TT/MM/TP/TC/FT	Textile Mathematics-III	I
3	MMTT/TC	Polymer Science	I	MMTT/TC	Polymer Science	I
4	MMTT	Manmade Fibre Manufacture-I	I	MMTT	Manmade Fibre Manufacture-I	I
5	MMTT	Manmade Staple Yarn Manufacture-II	I	MMTT	Manmade Staple Yarn Manufacture-III	I
6	MMTT	Manmade Fabric Manufacture-II	I	MMTT	Manmade Fabric Forming Technology-III	I



**D.K.T.E.SOCIETY'S TEXTILE & ENGINEERING INSTITUTE, ICHALKARANJI.**

**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- M.M.T.T. (MAN MADE TEXTILE TECHNOLOGY) Sem – II**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC	Thermal & Air Engineering	II	TT/MM/TP/TC	Textile Electronics-I	II
2	TT/MM/TP/TC/FT	Textile Mathematics-IV	II	TT/MM/TP/TC/FT	Textile Mathematics-IV	II
3	MMTT	Manmade Fibre Manufacture-II	II	MMTT	Manmade Fibre Manufacture-II	II
4	TT/MMTT	Chemical Processing of Textiles-I	II	TT/MMTT	Chemical Processing of Textiles-I	II
5	MMTT	Manmade Staple Yarn Manufacture-III	II	MMTT	Manmade Staple Yarn Manufacture-IV	II
6	MMTT	Manmade Fabric Manufacture-III	II	MMTT	Manmade Fabric Forming Technology-IV	II
7	TT/MMTT	Textile Design & Colour	II	<b>TT/MMTT</b>	<b>Textile Design &amp; Colour</b>	<b>I</b>

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**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- T.P.E. (TEXTILE PLANT ENGINEERING) Sem – I**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC/FT	Advanced Computer Programming	I	TT/MM/TP/TC	Thermal & Air Engineering	I
2	TT/MM/TP/TC/FT	Textile Mathematics – III	I	TT/MM/TP/TC/FT	Textile Mathematics – III	I
3	TPE	Material Engineering	I	TPE	Material Engineering	I
4	TPE	Manufacturing Processes	I	TPE	Manufacturing Processes-II	I
5	TPE	Yarn Manufacturing Machinery-II	I	TPE	Yarn Manufacturing Machinery-III	I
6	TPE	Fabric Manufacturing Machinery-II	I	TPE	Fabric Manufacturing Machinery-III	I

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**SECOND YEAR B.TEXT.- T.P.E. (TEXTILE PLANT ENGINEERING) Sem – II**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC	Thermal & Air Engineering	II	TT/MM/TP/TC	Textile Electronics-I	II
2	TT/MM/TP/TC/FT	Textile Mathematics – IV	II	TT/MM/TP/TC/ FT	Textile Mathematics – IV	II
3	TPE	Electrical Technology	II	TPE	Electrical Technology	II
4	TPE	Physical Properties of Textiles	II	TPE	Physical Properties of Textiles-I	II
5	TPE	Yarn Manufacturing Machinery-III	II	TPE	Yarn Manufacturing Machinery-IV	II
6	TPE	Fabric Manufacturing Machinery-III	II	TPE	Fabric Manufacturing Machinery- IV	II
7	TPE	Textile Machine Drawing	II	TPE	Textile Machine Drawing	I

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**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- T.C. (TEXTILE CHEMISTRY) Sem – I**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC/FT	<b>Advanced Computer Programming</b>	I	TT/MM/TP/TC	<b>Thermal &amp; Air Engineering</b>	I
2	TT/MM/TP/TC/FT	Textile Mathematics-III	I	TT/MM/TP/TC/FT	Textile Mathematics-III	I
3	MMTT/TC	Polymer Science	I	MMTT/TC	Polymer Science	I
4	TC	Chemistry of Textile Fibres-II	I	TC	Chemistry of Textile Fibres-II	I
5	TC	Spinning Technology	I	TC	Spinning Technology	I
6	TC	<b>Technology of Bleaching &amp; Mercerising</b>	I	TC	<b>Technology of Pretreatments-I</b>	I

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**Equivalence of subject at Second Year B. Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- T.C. (TEXTILE CHEMISTRY) Sem – II**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC	Thermal & Air Engineering	II	TT/MM/TP/TC	Textile Electronics-I	II
2	TT/MM/TP/TC/FT	Textile Mathematics – IV	II	TT/MM/TP/TC/FT	Textile Mathematics – IV	II
3	TC	Chemistry of Textile Fibres-III	II	TC	Chemistry of Textile Fibres-III	II
4	TC	Chemistry of Dyes & Pigments	II	TC	Chemistry of Dyes & Pigments	II
5	TC	Weaving Technology	II	TC	Weaving & Knitting Technology	II
6	TC	Fluid Flow & Heat Transmission	II	TC	Technology of Pretreatments-II	II
7	TC	Printed Textile Design & Colour	II	TC	Printed Textile Design & Colour	I

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**Equivalence of subject at Second Year B.Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- F.T. (FASHION TECHNOLOGY) Sem – I**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	TT/MM/TP/TC/FT	<b>Advanced Computer Programming</b>	I	FT	<b>Basics of Electronics</b>	I
2	TT/MM/TP/TC/FT	Textile Mathematics-III	I	TT/MM/TP/TC/FT	Textile Mathematics-III	I
3	FT	Fabric Structure & Design	I	FT	Fabric Structure & Design	I
4	FT	<b>Basics of Appara Production Processes</b>	I	FT	<b>Testing of Fibres &amp; Yarns</b>	I
5	FT	<b>Yarn Manufacture</b>	I	FT	<b>Textile Manufacture</b>	I
6	FT	<b>Fabric Manufacture</b>	I	FT	<b>Pattern Engineering – I</b>	I

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**Equivalence of subject at Second Year B. Text. to Revised Textile Courses.**

**SECOND YEAR B.TEXT.- F.T. (FASHION TECHNOLOGY) Sem – II**

<b>SR. NO.</b>	<b>COMMON TO COURSE</b>	<b>PRE-REVISED SUBJECTS</b>	<b>SEMISTER</b>	<b>COMMON TO COURSE</b>	<b>REVISED SUBJECTS</b>	<b>SEMISTER</b>
1	FT	Yarns & Fabrics for Fashion Applications	II	FT	Yarns & Fabrics for Fashion Applications	II
2	TT/MM/TP/TC/FT	Textile Mathematics – IV	II	TT/MM/TP/TC/FT	Textile Mathematics – IV	II
3	FT	Chemical Processing of Textiles	II	FT	Chemical Processing of Textiles	II
4	FT	Pattern Making & Garment Construction-I	II	FT	Pattern Making & Garment Construction-II	II
5	FT	Testing of Textiles & Apparels	II	FT	Testing of Textiles & Apparels	II
6	FT	Fashion Illustration	II	FT	Fashion Illustration	II
7	FT	Textile Design & Colour	II	FT	Textile Design & Colour	II