

III SEMESTER (Textile Chemistry)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
3TC1	Textile Fibers	3	-	-	3	20	80	-	100
3TC2	Principles of Textile Manufacturing – I	3	-	-	3	20	80	-	100
3TC3	Physical Chemistry	3	-	-	3	20	80	-	100
3TC4	Introduction to Wet Processing	3	-	-	3	20	80	-	100
3TC5	Electronics & Microprocessors in Textiles	3	-	-	3	20	80	-	100
3TC6.1	Elective Applied Statistics	3	-	-	3	20	80	-	100
3TC6.2	Nano technology								
Total		18	-	-	-	120	480	-	600
3TC7	Textile Fiber Lab	-	-	4	3	60	-	40	100
3TC8	Electronics & Microprocessor Lab	-	-	2	3	30	-	20	50
3TC9	Principles of Textile Manufacturing Lab – I	-	-	4	3	60	-	40	100
3TC10	Introduction to Wet Processing Lab	-	-	4	3	60	-	40	100
3TC11	Discipline & Extra Curricular Activities	-	-	-	-	50	-	-	50
Total		-	-	14	-	260	-	140	400
Grand Total		18	-	14	-	380	480	140	1000

IV SEMESTER (Textile Chemistry)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
4TC1	Principles of Textile Manufacturing – II	3	-	-	3	20	80	-	100
4TC2	Analytical Chemistry	3	-	-	3	20	80	-	100
4TC3	Theory of Dyeing	3	-	-	3	20	80	-	100
4TC4	Fabric Preparation	3	-	-	3	20	80	-	100
4TC5	Structure & Properties of Fibers	3	-	-	3	20	80	-	100
4TC6.1	Elective Object Oriented Programming	3	-	-	3	20	80	-	100
4TC6.2	Applied Mechanics								
Total		18	-	-	-	120	480	-	600
4TC7	Principles of Textile Manufacturing – II	-	-	4	3	60	-	40	100
4TC8	Analytical Chemistry Lab	-	-	4	3	60	-	40	100
4TC9	Experimental Process Lab -I	-	-	4	3	60	-	40	100
4TC10	Object Oriented Programming Lab or Applied Mechanics Lab	-	-	2	3	30	-	20	50
4TC11	Discipline & Extra Curricular Activities	-	-	-	-	50	-	-	50
Total		-	-	14	-	260	-	140	400
Grand Total		18	-	14	-	380	480	140	1000

V SEMESTER (Textile Chemistry)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
5TC1	Advance Organic Chemistry	3	-	-	3	20	80	-	100
5TC2	Technology of Dyeing	3	-	-	3	20	80	-	100
5TC3	Chemistry of High Polymers	3	-	-	3	20	80	-	100
5TC4	Chemistry & Physics of Dyes	3	-	-	3	20	80	-	100
5TC5	Textile Testing – I	3	-	-	3	20	80	-	100
5TC6.1	Elective Energy Conservation & Wet Processing Practical Applications of Statistics	3	-	-	3	20	80	-	100
5TC6.2									
Total		18	-	-	-	120	480	-	600
5TC7	Introduction to Data Base System	-	-	2	3	30	-	20	50
5TC8	Color & Design Lab	-	-	4	3	60	-	40	100
5TC9	Textile Testing Lab – I	-	-	4	3	60	-	40	100
5TC10	Experimental process Lab – II	-	-	4	3	60	-	40	100
5TC11	Discipline & Extra Curricular Activities	-	-	-	-	50	-	-	50
Total		-	-	14	-	260	-	140	400
Grand Total		18	-	14	-	380	480	140	1000

VI SEMESTER (Textile Chemistry)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams	Maximum Marks Allocation			
		L	T	P		Internal/ Term	End Term	Practical	Total
6TC1	Technology of Textile Printing	3	-	-	3	20	80	-	100
6TC2	Computer Color Matching	3	-	-	3	20	80	-	100
6TC3	Polymers & Extrusion	3	-	-	3	20	80	-	100
6TC4	Textile Chemical Analysis	3	-	-	3	20	80	-	100
6TC5	Textile Testing – II	3	-	-	3	20	80	-	100
6TC6.1	Elective Technical Textiles Knitting technology Unit Operations & Chemical Engineering	3	-	-	3	20	80	-	100
6TC6.2									
6TC6.3									
Total		18	-	-	-	120	480	-	600
6TC7	Textile Printing Lab – I	-	-	2	3	30	-	20	50
6TC8	Computer Color Matching Lab	-	-	2	3	30	-	20	50
6TC9	Preparation of Dyes & Auxiliaries Lab	-	-	2	3	30	-	20	50
6TC10	Textile Chemical Analysis Lab	-	-	4	3	60	-	40	100
6TC11	Textile Testing Lab – II	-	-	4	3	60	-	40	100
6TC12	Discipline & Extra Curricular Activities	-	-	-	-	50	-	-	50
Total		-	-	14	-	260	480	140	400
Grand Total		18	-	14	-	380	480	140	1000

VII SEMESTER (Textile Chemistry)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation			
		L	T	P		Internal/Term	End Sem Exam	Practical	Total
7TC1	Dyeing of Synthetics & Blends	3	-	-	3	20	80	-	100
7TC2	Technology of Finishing	3	-	-	3	20	80	-	100
7TC3	Man Made Fiber production	3	-	-	3	20	80	-	100
7TC4	Engineering of textile Structures – I	3	-	-	3	20	80	-	100
7TC5	Pollution Control & Process House Management	3	-	-	3	20	80	-	100
7TC6.1	Elective Wet Processing Machines	3	-	-	3	20	80	-	100
7TC6.2	Business Environment & Marketing management								
7TC6.3	Wet Processing of Wool								
Total		18	-	-		120	480	-	600
7TC7	Dyeing of Synthetic Fibers	-	-	4	3	60	-	40	100
7TC8	Textile Finishing Lab	-	-	4	3	60	-	40	100
7TC9	Project Part - I	-	-	2	-	-	-	40	50
7TC10	Mill Training Seminar	-	-	2	-	60	-	-	100
7TC11	Discipline & Extra Curricular Activities	-	-	-	-	50	-	-	50
Total		-	-	12	-	230	-	90	400
Grand Total		18	-	12	-	350	480	90	1000

VIII SEMESTER (Textile Chemistry)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks			Total
		L	T	P		Internal/Term	End Sem.	Practical	
8TC1	Textile Auxiliaries	3	-	-	3	20	80	-	100
8TC2	Finishing of Synthetics & Blends	3	-	-	3	20	80	-	100
8TC3	Engineering of Textile Structure - II	3	-	-	3	20	80	-	100
8TC4.1	Elective Materials & Human Resource Management	3	-	-	3	20	80	-	100
8TC4.2	Apparel Industry & Garment Manufacturing								
8TC4.3	Entrepreneurship Venture & Textile Hazard								
Total		12	-	-	-	80	320	-	400
8TC5	Dyeing of Synthetics & Blends	-	-	4	3	60	-	40	100
8TC6	Textile Printing Lab – II	-	-	4	3	60	-	40	100
8TC7	Advance Experiments in Dyeing	-	-	2	3	30	-	20	50
8TC8	Project Part – II	-	-	4	-	120	-	80	200
8TC9	Seminar Presentation	-	-	4	-	60	-	40	100
8TC10	Discipline & Extra Curricular Activities	-	-	-	-	50	-	-	50
Total		-	-	18	-	380	-	220	600
Grand Total		12	-	18	-	460	320	220	1000

**THIRD SEMESTER
B. TECH. (Textile Chemistry)**

TEXTILE FIBERS**[3TC1]**
[Common with 3TT4, 3TE3]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Definition and classification of textile fibers with reference to their utilization in textile industry • Introduction to impurities in natural fibers
II	<ul style="list-style-type: none"> • Cultivation and retting practices, • Fiber morphology, • Physical and chemical properties of natural cellulosic fibers viz. cotton, jute, flex, rammie, hemp, sunn, coir. • Varieties of cotton
III	<ul style="list-style-type: none"> • Varieties, sorting and grading of wool • Morphological structure of wool • Physical and chemical properties of wool fiber
IV	<ul style="list-style-type: none"> • Varieties of silk • Rearing of silk worm, cocooning, silk reeling, throwing and weighting • Varieties of silk yarns and fabrics • Morphology, physical and chemical properties of silk fiber
V	<ul style="list-style-type: none"> • Brief outline of manufacturing process and properties of regenerated fibers viz. viscose rayon, cellulose, triacetate, cupraammonium rayon, polynosics. • Brief manufacturing process and properties of important synthetic fibers viz. Polyester, Nylon, Acrylics etc. • Introduction to some newly developed fibers viz. Lycra, Spandex, Polybutylene, Terephthalate, Lyocell, Casein

PRINCIPLES OF TEXTILE MANUFACTURING – I**[3TC2]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • System of expressing yarn linear density. • Introduction to Cotton, Woolen and Worsted systems of yarn production
II	<ul style="list-style-type: none"> • Basic principle of opening, cleaning, Blow-room, Carding.
III	<ul style="list-style-type: none"> • Combing, drawing and roving • Ring spinning Doubling. • Twist and twist multiplier
IV	<ul style="list-style-type: none"> • Introduction to non-conventional spinning systems viz. air jet, open end, friction-spinning. • Calculations pertaining to draft and production of the machines dealt with course
V	<ul style="list-style-type: none"> • Properties and end uses of ring spun, rotor spun and air jet spun yarns • Brief description of fancy yarns, ply cable yarn, core spun yarn

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Classification, difference between colloidal solution, true solution and suspension. Preparation, properties and purification • Origin of charge, coagulation and protective action • Application of colloids
II	<ul style="list-style-type: none"> • Theoretical properties of colloidal systems interfacial phenomena particle kinematics, electrical properties, viscosity characteristics and studies • Lyophobic and Lyophilic solutions, gels and emulsions • Absorption and adsorption characteristics of adsorption • Types of adsorption, Langmuir adsorption, application of adsorption
III	<ul style="list-style-type: none"> • Thermo Chemistry: Heat of reaction at constant volume and pressure • Kirchoff's equation • Heat of combustion, Neutralization and formation • Laws of thermo-chemistry
IV	<ul style="list-style-type: none"> • Electro-Chemistry: Phenomena of electrolysis • Faraday's Laws of electrolysis • Conductance of electrolytes • Effect of dilutions, pressure and temperature on conductance • Migration of ions, Transport number • Kohlrausch's law and its application • Electro chemical cells
V	<ul style="list-style-type: none"> • Kinetics of homogeneous reactions • First and second order reactions • Theory of catalysis • Acid -Base catalysis some industrial processes by different catalysts

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Introduction of Wet Processing <ul style="list-style-type: none"> • Impurities in raw cotton, wool and silk. • Adventitious impurities in Grey fabrics made out of cotton, wool and silk. • Elementary knowledge of processing. • Objects of different processes involved e.g., singeing, desizing, scouring, bleaching.
II	Pretreatments: <ul style="list-style-type: none"> • Processing sequence in conversion of Grey cotton goods into semi bleached, full bleached and color bleached fabrics • Chemical used in these processes • Introductory knowledge of machinery used in scouring and bleaching of cotton fabric
III	Dyeing: <ul style="list-style-type: none"> • General method of dyeing by important classes of dyes on natural and man-made fibers e.g., direct, acid, basic, vat, azoic, sculpture and disperse dyes • Chemicals/auxiliaries used in dyeing • Introductory knowledge of dyeing machines
IV	Printing: <ul style="list-style-type: none"> • Introduction to various methods of printing of textiles, instruments and machinery used • Introduction to various styles of printing viz. direct, discharge, resist etc.
V	Finishing: <ul style="list-style-type: none"> • Object of finishing and application of various type of finishes • Elementary knowledge of finishing machines

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 2	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<p>Semiconductor Diodes: Introduction, characteristics and their applications</p> <ul style="list-style-type: none"> • Ideal diode • PN semiconductor diode • Diode equivalent circuits • Zener diode • Light diodes
II	<p>Field Effect Transistors:</p> <ul style="list-style-type: none"> • Introduction, Construction and characteristics of JFETS • Transfer characteristics • BJT, their characteristics and applications. <p>Transistor Amplifiers:</p> <ul style="list-style-type: none"> • Classification of amplifiers • Biasing and compensation techniques • R-C coupled amplifier, tuned amplifier, operational amplifier their characteristics and applications • Digital to analog and analog to digital conversion
III	<p>Operational Amplifiers (OpAmp):</p> <ul style="list-style-type: none"> • Introduction, Block diagram, parameters of OpAmp IC 741 • OpAmp in inverting and non-inverting configuration • Some applications of OpAmp <p>Semiconductor Devices:</p> <ul style="list-style-type: none"> • Introduction of silicon controlled rectifier • GTO • TRIAC, DIAC • Injunction transistors, IGBT
IV	<p>Cathode Ray Oscilloscope:</p> <ul style="list-style-type: none"> • Introduction, Cathode ray tube – theory and construction <p>Transducers:</p> <ul style="list-style-type: none"> • Introduction, resistive, Inductive, capacitive transducers. • Construction and working principle of strain gauge, LVDT, RVDT • Summing devices, measurement of linear displacement • Pressure measuring using transducers • Construction and working of thermocouple and thermistor, measurement of temperature using them <p>Data Acquisition Systems:</p> <ul style="list-style-type: none"> • Introduction, components and uses
V	<p>Process control:</p> <ul style="list-style-type: none"> • Application of microprocessors in process control with special emphasis on textiles • Minimum microprocessor based system requirement • Examples of process control from textile and garment manufacturing engineering

ELECTIVES
APPLIED STATISTICS

[3TC6.1]
[Common with 3TT6.1 & 3TE6.1]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Curve fitting (least square method) • Fitting of straight line • Second degree parabola • Exponential and logarithmic curves
II	<ul style="list-style-type: none"> • Correlation and regression • Partial and multiple correlation, • Multiple regression
III	<ul style="list-style-type: none"> • Probability • Probability distributions • Binomial, Poisson • Normal distribution, application aspects of normal distribution , • Hypergeometric distribution
IV	<ul style="list-style-type: none"> • Estimation of parameters • Testing of hypothesis • t-test • F-test • Chi-square test
V	<ul style="list-style-type: none"> • Quality control • Control charts (X, R & P), action & warning limits • Interpretation of control charts

NANO TECHNOLOGY

[3TC6.2]
[Common with 3TT6.1 & 3TE6.1]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<p>Introduction and fundamental science behind Nano technology:</p> <ul style="list-style-type: none"> • Definition, description about size and measures, electron, atoms and ions, molecules • Molecular recognition • Quantum mechanics and quantum ideas and some Nano challenges.
II	<p>Measuring instruments of Nano structures:</p> <ul style="list-style-type: none"> • Scanning probe instruments, spectroscopy, electrochemistry, electron microscopy • Tools to make Nano structures – lithography methods, scanning probe instruments • Nano scale crystal growth, polymerization • Nano bricks and building blocks
III	<p>Points and places of interest:</p> <ul style="list-style-type: none"> • Smart materials, sensors • Nano scale bio-structures • Optics, fabrication, modeling, electronics
IV	<p>Applications:</p> <ul style="list-style-type: none"> • Nano polymer, Nano tubes, Nano fibers • Nano catalyst and consumer goods
V	<ul style="list-style-type: none"> • Nano business • Nano ethics • Nano resource

PRACTICALS

TEXTILE FIBERS LAB: (3TC 7)

MM 100

Ex. Hrs: 3

Principle of microscopy, microscopic identification of fibers, preparation and mounting of specimen for longitudinal view.

Cross-section cutting -microtomy cork method, metal plate method, Hardy's microtone, mountants and reagents for fiber microscopy.

Standard scheme of analysis of homogeneous fiber and blends by physical and chemical methods.

Qualitative and quantitative determination of components.

ELECTRONICS AND MICROPROCESSORS LAB: (3TC 8)

MM 50

Ex. Hrs: 3

Study of CRO

Study of Lab components

Study of VI characteristics of DIODE

Study of VI Characteristics of Zener Diode

Study of VI Characteristics of Transistor in CB Configuration.

Study of VI Characteristics of FET SCR.

Study of OpAmp in Inverting Mode

Study of OpAmp of non-inverting mode

Study of OpAmp as Adder, Subtractor, Integrator, Differentiator

Study of working of Data Acquisition System

Study of LVDT

Study of VI Characteristics of RTD, Thermistor

Study of Stain gauge.

PRINCIPLE OF TEXTILE MANUFACTURING LAB - I : (3TC 9)

MM 100

Ex. Hrs: 3

Demonstration and working principle of various spinning machines used for yarn manufacturing such as Blow room, Carding, Drawing, Lap former, Combing, Simplex, Ring spinning etc.

Introduction to open end spinning, air jet spinning, dref, friction spinning.

FABRIC PREPARATION LAB (3TC 10)

MM 100

Ex. Hrs: 3

Desizing of cotton by rot steeping, acid and enzymatic method.

Scouring of cotton and estimation of weight loss in scouring.

Bleaching of cotton yarns and fabrics.

Mercerization of cotton yarns and fabrics.

Scouring of wool by Solvent and Emulsion method. Carbonization of wool, bleaching of wool etc.

Degumming of silk.

Bleaching of synthetic fibers.

**FOURTH SEMESTER
B. TECH. (Textile Chemistry)**

PRINCIPLES OF TEXTILE MANUFACTURING – II

[4TC1]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Weaving preparation: <ul style="list-style-type: none"> Object and basic principles of working of winding, warping, drawing-in and sizing machines
II	Weaving mechanism: <ul style="list-style-type: none"> Classification of weaving machines Basic mechanism of a plain loom and passage of warp through loom Plain tappet shedding motion, climax dobby Side lever under-pick motion, sley beat up motion
III	<ul style="list-style-type: none"> Cimmco semi positive let off motion Five wheel and seven wheel take up motion Introduction to non conventional looms e.g. Projectile, Rapier, Jet looms .
IV	Fabric Defects: <ul style="list-style-type: none"> Brief introduction of basic defects like starting mark, box mark, broken pick, slack and tight selvage, missing end (chira), reed marks, stains, temple mark . Brief introduction to set theory Specification for standard woven fabric Calculations: <ul style="list-style-type: none"> Weight of warp, weft and fabric Production of loom
V	Fabric Structure: <ul style="list-style-type: none"> Methods of fabric presentation weave repeat unit drafts and lifting plan constructions Construction of elementary weaves e.g. plain, twill, satin and sateen weaves Plain weave derivatives, weaves constructed on twill bases namely Herring bone waved and broken twills

ANALYTICAL CHEMISTRY

[4TC2]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Preparation, properties and uses Hydrogen ion concentration and its determination using: (1) Hydrogen-Electrode. (2) Glass-Electrode
II	Oxidation - Reduction: <ul style="list-style-type: none"> Oxidizing and reducing agents e.g., Peroxide, Chlorite, Hydro sulphite, Potassium permanganate, Potassium dichromate, etc.
III	Chromatography: <ul style="list-style-type: none"> Chromatographic methods of separation, adsorption, exchange and gas chromatography Solvent exchange
IV	Crystallography: <ul style="list-style-type: none"> Introduction, classification of crystals Crystal structure by X-ray diffraction, Bragg method Rotating crystal method and Powered method
V	Spectroscopy: <ul style="list-style-type: none"> Fundamental principles of spectroscopy, Instrumentation and brief out lines of UV, IR and NMR spectroscopy, their applications in textiles

THEORY OF DYEING**[4TC3]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Physical and Chemical principles involved in the application of Dyestuff e.g. Direct, Basic, Acid, Vat, Disperse, Azoic, Pigment dyes etc. to textile materials
II	<ul style="list-style-type: none"> Various isotherms Thermodynamics and Kinetics of Dyeing
III	<ul style="list-style-type: none"> Theories of dyeing e. g. Absorption, Electrochemical, Colloidal and Solid solution, free volume, static pore theory etc.
IV	<ul style="list-style-type: none"> Classification and recent development in dyes e.g. Direct, Reactive etc. Relation between color and chemical constitution Relation between substantivity and chemical constitution of dyes Compatibility of dyes
V	<ul style="list-style-type: none"> Concept of solubility parameters, Mechanism of carrier in jet dyeing, Diffusion coefficient and its measurement

FABRIC PREPARATION**[4TC4]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Impurities in raw cotton and Grey cloth and chemical process involved in their removal Shearing: Object of shearing, principles of working of shearing machines Singeing: Object of singeing, different types of singeing machines and their working
II	<ul style="list-style-type: none"> Desizing: Different methods of desizing, rapid desizing etc. Scouring: Scouring of cotton in Kiers, J-boxes, continuous methods, solvent scouring etc, different types of washing machines.
III	<ul style="list-style-type: none"> Bleaching: Mechanism of bleaching using various bleaching agents viz. bleaching powder, sodium hypo-chlorite, peroxides Effect of pH on bleaching, semi continuous and continuous methods, faults and remedies. Short sequences, combined preparatory processes, low temperature preparatory processes Rapid bleaching, modifications in bleaching plant, bleaching machines viz. kiers, J-boxes, bleaching cisterns, scutchers Chlorine free bleaching
IV	<ul style="list-style-type: none"> Scouring and bleaching of jute, Linen, wool and silk Optical brighteners
V	<ul style="list-style-type: none"> Mercerization: Methods and equipments for yarn and fabric mercerization, Factors affecting efficiency of mercerization, Physical and chemical changes in cotton Mercerization of cotton and PC blends, Causticization. Hot mercerization, Liquid ammonia treatment of cotton etc.

STRUCTURE AND PROPERTIES OF FIBER**(4TC 5)****[Common with 4TT5]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Structure of fibres • Morphology and order in fibre structure • Theories of fine structures of fibres
II	<ul style="list-style-type: none"> • Determination of degree of crystallinity • Orientation and crystal size • Electrical properties
III	Theories of mechanical properties of fibres <ul style="list-style-type: none"> • Phenomenological approach-stress-strain, creep and relaxation behaviour of simple models • Applications of Eyring's model to predict mechanical response of fibres (Only the interpretation of equation, no derivation) • Integral approach and interpretation of mechanical properties of fibres from their structures • Effect of crystal linearity and orientation on mechanical properties of fibres
IV	<ul style="list-style-type: none"> • Thermal properties • Molecular motions and transition phenomenon • First order and second order transitions • Effect of transition on strength of fibers • Concept of heat setting and pleating
V	Properties depending on the amorphous regions <ul style="list-style-type: none"> • Moisture regain, Swelling, Heat of sorption • Optical properties

ELECTIVES**OBJECT ORIENTED PROGRAMMING****[4TC6.1]****[Common with 4TT6.1]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 2	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Principles of object oriented programming <ul style="list-style-type: none"> • Beginning with C++ • Tokens, Expression and Control structures • Main function, call by reference, inline, friend • Classes and objects
II	Function in C++ <ul style="list-style-type: none"> • Nesting of member function • Private member function • Array within a class • Static data member • Static member function
III	Constructors and Destructors <ul style="list-style-type: none"> • Copy constructor • Multiple constructor in a class • Destructor
IV	Operator Overloading <ul style="list-style-type: none"> • Unary, Binary
V	Inheritance: Extending Classes <ul style="list-style-type: none"> • Single inheritance • Multiple inheritance, Multi level inheritance • Working with files

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 2	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Strength of materials <ul style="list-style-type: none"> • Behavior of common materials in tension & compression • Characteristic strain-stress curves of engineering materials • Hook's law • Elastic-limit working stress, ultimate stress, factor of safety • Poisson ratio • Elastic constants & their relationship
II	Shearing & Bending <ul style="list-style-type: none"> • Center of gravity, Moment of Inertia of area of symmetrical, un-symmetrical & built-up sections • Simple beams subjected to transverse loading • Shear force and bending moment diagram • Theory of bending • Normal stress due to bending
III	Torsion of shaft: <ul style="list-style-type: none"> • Torsional shear stresses in solid, hollow & stepped circular shafts • Angular deflection & power transmission capacity • Application to close coil helical spring
IV	Fluid Mechanics – I: <ul style="list-style-type: none"> • Basic definitions & fluid properties: definition of fluid, incompressible and compressible fluids • Mass density, specific weight, relative density, specific volume • Ideal fluid, viscosity, Newtonian & Non-Newtonian fluids • Kinematics & conservation of mass: flow classification, fluid velocity & acceleration • Continuity equation for one dimensional and three dimensional fluid flow
V	Fluid Mechanics – II: <ul style="list-style-type: none"> • Fluid momentum: momentum theorem, application of momentum equation • Bernoulli equation • Application of Bernoulli equation: orifice meter, venturi meter • Flow through pipe • Head losses due to sudden enlargement, contraction, entrance, exit, obstruction, bend and pipe fitting • Power transmission by fluid

B. PRACTICALS

PRINCIPLES OF TEXTILE MANUFACTURING Lab II: (4TC 7)

MM 100

Ex. Hrs: 3

Winding, warping, sizing machines and drawing in. Passage of warp through plain power loom. Loom mechanism. Analysis of important particulars of fabrics made in plain, twill, satin/sateen weaves.

ANALYTICAL CHEMISTRY LAB : (4 TC8)

MM 100

Ex. Hrs: 3

Analysis of soap- Total fatty matter, alkalinity, free acids and unsaponifiable matter. Estimation of sodium bi-sulphite, sodium- sulphide and sodium hydro-sulphite. Determination of strength of hypochlorite and Hydrogen peroxide, estimation of strength of sodium hydroxide containing sodium carbonate volumetrically and by Tw meter.

Estimation of aluminum, iron, tin, chromium and copper.

Analysis of phenols and formaldehyde.

Saponification, Acid value and Iodine value of oils. Determination of flash point of oil.

Determination of viscosity of various substance used in textile manufacturing.

Chromatographic separation.

Effluent testing : Determination of some pollutant substances present in effluent from different industries i.e., carbonates , bi-carbonate, hydroxide, chlorine concentration, chemical oxygen demand etc by volumetric analysis.

Inorganic and organic preparations .

EXPERIMENTAL PROCESS LAB: I (4 TC 9)

MM 100

Ex. Hrs: 3

Dyeing of cotton and rayon with direct, sulphur, vat, reactive and azoic dyes etc.

Dyeing of wool and silk with acid, premetallised and chrome dyes.

After treatment to improve the fastness properties.

Dyeing of compound shades.

Application of natural colors on cotton, wool and silk.

Dyeing of vat, reactive and azoic by batch wise semi continues and continues methods.

OBJECT ORIENTED PROGRAMMING-LAB (4TC 10)

MM 50

Ex. Hrs: 3

Practical based on C++ programming and application in textile.

FIFTH SEMESTER
B. TECH. (Textile Chemistry)

ADVANCE ORGANIC CHEMISTRY
(5TC 1)

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Origin of organic products and their chemistry <ul style="list-style-type: none"> • Destructive distillation of coal and its products • Isolation of products for manufacturing of dye intermediates • Chemistry of benzene and naphthalene with their orientation rules
II	Nitration <ul style="list-style-type: none"> • General methods of nitration • Nitration of toluene, phenol, anilene, naphthalene series
III	Sulphopnation <ul style="list-style-type: none"> • General methods of sulphonation • Dye sulphonation • Sulphonation of benzene, anilene, naphthalene series, naphthols sulphothols, sulphonic acids
IV	Amination <ul style="list-style-type: none"> • General methods of amination • Amination of nitro compounds • Preparation of diazo salts • Amination of naphthalene series
V	Dye Intermediates <ul style="list-style-type: none"> • Dye intermediates related to hydroxy • Halogen compounds and heterocyclic based compounds

TECHNOLOGY OF DYEING
(5TC 2)

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	The principle and methods of dyeing <ul style="list-style-type: none"> • Natural and regenerated fibers with various classes of dyes e.g. • Direct, Basic, Acid
II	The principle and methods of dyeing <ul style="list-style-type: none"> • Natural and regenerated fibers with various classes of dyes e.g. • Vat, Sulphur, Reactive, Azoic, Aniline black, Mineral Khaki, Phtalocynine, Alcian Blue • Application of Pigments
III	Dyeing machines <ul style="list-style-type: none"> • Jigger, Winch, Soft flow machines, Padding Mangles • Development in dyeing machines
IV	<ul style="list-style-type: none"> • Dyeing of loose stocks and fibers • Faults in dyeing and remedial measures
V	<ul style="list-style-type: none"> • Dyeing with natural dyes and mordants • Dyeing of Denim fabrics

CHEMISTRY OF HIGH POLYMERS**[5TC3]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Terms, definitions and scope of polymer chemistry, plastic, fibers and rubbers. Chemistry of polymerization viz. chain polymerization, step polymerization.
II	<ul style="list-style-type: none"> Kinetics of polymerization-chain polymerization, cationic polymerization, anionic polymerization. Poly-condensation with special reference to polyester, polyamide, phenol formaldehyde, urea formaldehyde, epoxy resin.
III	<ul style="list-style-type: none"> Types of molecular weights, Measurement of molecular weights and molecular weight dependent properties. Poly-disparity
IV	<ul style="list-style-type: none"> Chemical and geometrical structure of polymer molecule. Transitions and its measurement. Differential scanning calorimetry (DSC), Thermo-gravimetric analysis (TGA) .
V	<ul style="list-style-type: none"> Polymer solutions Thermodynamics of polymer dissolution Florry and Huggins theory of polymer solutions. Chemical Composition of fibrous polymers viz. cellulose, wool ,silk,

CHEMISTRY AND PHYSICS OF DYES**(5TC 4)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Historical development of natural and synthetic dyes Dyestuff industry in India Classification of dyes according to chemical constitution Methods of preparation of nitroso, nitro, azo dyes
II	<ul style="list-style-type: none"> Methods of preparation of pyrazolone, acridine, xanthine, ketoamine, anthraquinones, azines, thiazines, oxazines, indigo, thio indigo, alizarine and various dyes.{Reaction Based}
III	<ul style="list-style-type: none"> Chemistry of reactive, acid, basic, direct, sulphur, vat dyes, sulphurised vat colors,coupling of different naphthols Disperse dyes manufacture and purification
IV	<ul style="list-style-type: none"> Relation between- color and chemical constitution, substantively and chemical constitution Chemistry of various types of pigments
V	<ul style="list-style-type: none"> Photo physical processes (Phosphorescence and fluorescence) following light absorption Fluorescent brightening agents and miscellaneous dyes Toxicity of dyes and intermediates

Textile Testing-I

[5TC5]
[Common with 5TT5 & 5TE5]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<p>Introduction to textile testing</p> <ul style="list-style-type: none"> • Aim and scope <p>Sampling techniques</p> <ul style="list-style-type: none"> • General requirements, squaring, cut squaring and Zoning methods for sampling of raw material • Sampling techniques for yarn and fabrics for specific tests • Routine Sampling techniques used in the textile industry
II	<p>Hygrometry and moisture relations of textiles</p> <ul style="list-style-type: none"> • Terms and definitions • Relation between Relative Humidity. and regain of textile materials • Equilibrium regain, hysteresis • Measurement of regain principle and operation of equipment • Official regain and concept of current invoice weight
III	<p>Measurement of fiber physical characteristics</p> <ul style="list-style-type: none"> • Fiber length, fineness, maturity and foreign matter of cotton and other fibers • Principle, construction, operation and calibration of equipment in common use for measurement of above properties • Grading of different cottons • Nep testing of cotton
IV	<p>Fiber friction</p> <ul style="list-style-type: none"> • Theories and measurement of friction of single and fiber assemblies during drafting <p>Yarn numbering systems</p> <ul style="list-style-type: none"> • Numbering systems • Conversion methods • Measurement of yarn number <p>Measurement of yarn properties</p> <ul style="list-style-type: none"> • Twist in spun, continuous filament and ply yarns <p>Measurement of fabric properties</p> <ul style="list-style-type: none"> • Serviceability, wear and abrasion • Definitions, methods for measuring abrasion resistance and evaluation of results • Fabric creasing and crease recovery testing
V	<p>Methods of test for fabric dimensions and other physical properties</p> <ul style="list-style-type: none"> • Thickness • Weight • Crimp • Shrinkage • Air permeability • Wettability • Shower-proofness • Water- profness • Flame-resistance

Elective**Energy conservation in wet processing****(5 TC 6.1)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none">• Patterns of energy use• Efficiency of energy utilization and energy conservation• Sources of energy including non-conventional sources
II	<ul style="list-style-type: none">• Economics of energy system with special reference to textile industry
III	<ul style="list-style-type: none">• Waste heat recovery• Energy audits
IV	<ul style="list-style-type: none">• Process control in wet processing• New boilers
V	<ul style="list-style-type: none">• RF driers• Minimum application technique• Foam finishing• Vacuum system

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Sampling and Estimation <ul style="list-style-type: none"> Repeated Sampling, the mean and variance of a function of random variables, linear functions The central- limit theorem, sampling distribution of the mean The Chi-square test. Point estimates, interval estimation, confidence limit
II	Some standard significance tests <ul style="list-style-type: none"> Test for a single mean Large sample available the significance level The interpretation of significance test, single- tail test The interpretation of significance test, double tail test Error and the choice of the sample size Test for a single mean: small sample available Test for the difference between two means :independent sample Test for the difference between two means: matched sample Test for the difference between two variances
III	Probability <ul style="list-style-type: none"> Definition of probability Introduction to geometrical, Binomial, Poission and normal distribution Analysis of ranking data <ul style="list-style-type: none"> Rank co-relation Coefficient of concordance
IV	Quality control <ul style="list-style-type: none"> Control charts Action and warning limits The interpretation of control chart Control charts for defectives Control charts for defects Control charts for averages
V	Analysis of variance <ul style="list-style-type: none"> An introduction The design of experiments , random variation in experiments The test of significance The ANOVA table case (a) comparison with a control (b) Global comparisons Tukey's procedure, differences among treatments and Blocks Linear regression <ul style="list-style-type: none"> Relation between variables Fitting a straight line Variation about the regression line

B. PRACTICALS

INTRODUCTION TO DATA BASE SYSTEM: (5TC 7)

MM 50

Ex. Hrs: 3

1. master File, transaction File
2. Data Base Designing.
3. Creation, Deletion & Updating of Database.
4. SQL

Project:-Inventory management System.

COLOUR AND DESIGN : (5TC 8)

MM 100

Ex. Hrs: 3

Color, its nature and color perception in relation to the object, observer and light source.

Dimensions and Attributes of color combination.

Physical and Psychological aspects of color. Texture and its determinants.

Application of computer aided design to textile Printing, Color separation, color reduction, marker preparation, Screen preparation

Introduction to traditional Indian textiles and study of their Printing principles._

TEXTILE TESTING LAB –I: (5TC 9)

MM 100

Ex. Hrs: 3

Measurement of fiber length and its distribution, fineness, maturity, moisture content and strength using conventional methods and instruments. Fiber diameter and its variability, Measurement of Hank of sliver roving, and count of yarn and their variability. Single yarn strength and elongation lea strength measurement by conventional instruments. Twist of yarn. Crimp of fabric. Use of statistical techniques for evaluation of experimental results.

EXPERIMENTAL PROCESS LAB –II(5TC 10)

MM 100

Ex. Hrs: 3

To study the effect of various dyeing parameters on dye ability viz. time, temp etc

To study the effect of various chemicals and auxiliaries on dye ability viz. salt, leveling agents, dye fixing agents, carriers.

To study the effect of various after treatments on direct, sulphur dyes etc.

SIXTH SEMESTER

B. TECH. (Textile Chemistry)

TECHNOLOGY OF TEXTILE PRINTING**(6TC 1)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 2	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Principle of printing • Printing paste ingredients viz. various thickeners and other chemicals • Method of printing such as block, screen, roller printing
II	<ul style="list-style-type: none"> • Preparation of Screen for manual, flat bed and rotary screen printing machines • Engraving of design on roller • Styles of printing viz. Direct, Discharge, Resist etc. on natural, synthetic and their blends
III	<ul style="list-style-type: none"> • After treatment of printing material • Machines used for printing, dyeing, ageing, Steaming ,Curing
IV	Novelty printing process <ul style="list-style-type: none"> • Transfer printing of synthetic and cotton • Flock printing • Garment printing • Ink jet printing
V	<ul style="list-style-type: none"> • Pigment printing • Various type of pigments, binders, catalysts, emulsion thickening • Replacement of kerosene • Faults in printing and their prevention

COMPUTER COLOUR MATCHING**(6TC 2)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 2	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Theory and measurement of absorption spectrophotometer to qualitative and quantitative analysis of chemical substances in both transparent and opaque media in UV-VIS-NIR range • Color science-perception of color, light sources, object, observer • Color mixing laws-additive and subtractive mixing • Eye and color vision
II	<ul style="list-style-type: none"> • Color order systems- Munsell, CIE system, color atlas • CIE standard illuminants, observers, object, tristimulus values, chromaticity coordinates • Dominant wavelength and purity
III	<ul style="list-style-type: none"> • Transformation of CIE system, equation index • Whiteness and yellowness index • Color difference measurement, various equations, tolerance limit • Application in fastness testing • Metamerism phenomenon and its application to textiles, indexes
IV	<ul style="list-style-type: none"> • Reflectance curves, Kubelka –Munk theory, Strength measurement • Shade matching, data preparation, recipe prediction, correction, limitation and drawbacks of Computer Color Matching technique.
V	<ul style="list-style-type: none"> • Introduction to Chroma blend software • Color measuring instruments • Selection of instruments

POLYMERS AND EXTRUSION

[6TC3]
[Common with 6TT3]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<p>Polymers</p> <ul style="list-style-type: none"> • Definition of polymer, Classification of polymers, Different kinds of polymer materials, Fibrous polymers and their Morphology. • Molecular weight of polymer molecule, different types of molecular weight averages, Polydispersity, Molecular weight measurement methods. • Concept of micro-structure of chain molecules, crystallinity, orientation
II	<ul style="list-style-type: none"> • Basic principle of fluid flow during fibre spinning • Introduction to Melt spinning, melt spinning line, design and engineering of equipments, melt spinning variables and conditions for continuous spinning.
III	<ul style="list-style-type: none"> • Introduction to solution spinning processes and process variables, preparation of the dope and process of dry spinning, preparation of the spinning solution and process of wet spinning, coagulation, development the structure and morphology during solution spinning. • Comparative study of spinning processes.
IV	<p>Post extrusion processes</p> <ul style="list-style-type: none"> • Introduction of spin finish, functions of spin finishes, properties of spin finishes, spin finish components, methods of spin finish application, spin finish for staple fibres, filaments, yarns and other processes. Analysis of spin finish formulations, effect of spin finish on dyeing, problems associated with the use of spin finish.
V	<p>Drawing and setting process</p> <ul style="list-style-type: none"> • Introduction to drawing, drawing machines, the drawing behaviour of thermoplastic fibres, influence of drawing on structure and properties of fibres, draw warping. • Introduction to heat setting, nature of set, heat setting behaviour of polyamide and polyester fibres, measurement of degree of set.

TEXTILE CHEMICAL ANALYSIS**(6 TC 4)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Color fastness to light, washing, rubbing, sublimation, perspiration Quantitative estimation of bleaching agents
II	<ul style="list-style-type: none"> Evaluation of textile chemicals, auxiliary's viz. detergents, wetting agent, cross linking agents, softeners, stiffeners, silicone emulsions.
III	<ul style="list-style-type: none"> Water quality for dyeing, effect of contaminants on textile wet processing, Water effluents testing. Hardness, solid content dissolved and suspended, pH, Color, Chloride, fluoride, Chemical oxygen demand (COD), Bio- chemical oxygen demand (BOD), Oil and grease content
IV	<ul style="list-style-type: none"> Analysis of damage to fibers by heat, light, oxidation and reduction. Estimation of carbonyl and aldehyde groups in cellulose's, amino group in wool, silk and nylon End group analysis of polyester and nylon Fluidity measurement, copper number, estimation of degree of heat setting by Iodine absorption method, CDT and Shrinkage measurement
V	<ul style="list-style-type: none"> Estimation of desizing efficiency by various methods Test for estimating mercerization, Barium activity number, De-convolution count. Chromatographic separation of dyes, Paper chromatography, thin layer chromatograph, Gas chromatography Method of identification of dyes Quantitative estimation of dyes

TEXTILE TESTING -II**[6TC5]****[Common with 6TT5 & 6TE5]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Mechanical behavior of textiles <ul style="list-style-type: none"> Terms and definitions, expressing the results, quantities and units Introduction to visco-elasticity, creep and relaxation phenomenon Mechanical conditioning and recovery properties of textile
II	Experimental methods <ul style="list-style-type: none"> Principle of CRL, CRT and CRE type Tensile testing machines- various Instruments Factors affecting the results of tensile experiments Evaluation and interpretation of tensile experiments Evaluation and interpretation of tensile test results Tension winding test for yarns
III	Fabric strength testing <ul style="list-style-type: none"> Tensile, tearing and bursting strength tests Principle and operation of equipment, fabric bending, shearing and draping properties: terminology, quantities and units, Experimental method
IV	Evenness testing of yarns <ul style="list-style-type: none"> Nature and cause of irregularities Principle and methods of evenness testing, evaluation and interpretation
V	Yarn faults <ul style="list-style-type: none"> Classification Measurement, Causes and their remedies

**ELECTIVE
TECHNICAL TEXTILES**

[6TC6.1]
[Common with 6TT6.1 & 6TE6.2]

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<p>Introduction</p> <ul style="list-style-type: none"> • Definition • Textile materials in technical applications <p>Fibers</p> <ul style="list-style-type: none"> • Natural and man-made fibers suitable for technical application and their relevant properties <p>Geotextile</p> <ul style="list-style-type: none"> • Fibers used for geotextile applications. • Mechanics of reinforcement, filtration and drainage by geotextiles • Typical applications of woven and non-woven geotextiles
II	<p>Medical textiles</p> <ul style="list-style-type: none"> • Textiles in various medical applications • Textile materials used for medical applications. • Application oriented designing of typical medical textiles (e.g. porous graft or trashed tube) • Materials used and design procedures for protecting wounds • Cardiovascular application, Sutures
III	<p>Filtrations</p> <ul style="list-style-type: none"> • Principles of wet and dry filtrations • Characteristic properties of fibers and fabrics in selective example of filtration <p>Ropes and Cordages</p> <ul style="list-style-type: none"> • Application oriented structure and production of ropes, cordages and twines
IV	<p>Protective Clothing</p> <ul style="list-style-type: none"> • Thermal protection • Ballistic protection • Protection against micro organisms, chemicals and pesticides • Protection from electromagnetic radiation and static hazards
V	<p>Automotive Textiles</p> <ul style="list-style-type: none"> • Fibers used for automotive applications – upholstery, carpeting, pre-formed parts, type, safety devices, filters and engine compartment items • Brief description for the manufacture and application of these devices or parts

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Definition of Knitting , Knitted fabrics • General description of knitting machines (Flat and Circular and their classification) • Differences between woven and knitted fabric properties • Knit, Tuck and Float Stitches, their formation in machine and applications
II	<ul style="list-style-type: none"> • Type of different needles used in knitting process (Latch, Beard and Compound). • Knitting cycles • Classification of weft knitting machines • Basic weft knitted structures (Plain, Rib, Interlock, Purl). Their properties
III	<ul style="list-style-type: none"> • Circular machine used for plain knitted fabrics, Knitting geometry • Rib and Interlock double jersey • Purl knitting machine along with knitting cycle, design of cams
IV	<ul style="list-style-type: none"> • Classification of warp knitting machines • Description of Raschal and Tricot machines • Knitting cycle of these machines • Derivatives and ornamentation of weft knitted fabrics
V	<ul style="list-style-type: none"> • Nature and cause of irregularities • Derivatives and ornamentation of weft knitted fabrics • Knitted fabric faults, their causes and remedies. • Dry, Wet and Finished relaxed state of Knitted fabrics

UNIT OPERATIONS AND CHEMICAL ENGINEERING(6 TC 6.3)

Class B.TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Definition and scope of chemical engineering • Unit operations of chemical engineering • Material balance and molecular units, mole fractions • Gas laws, simple calculations based on these laws
II	<p>Mechanical separation</p> <ul style="list-style-type: none"> • Introduction to screens and screen analysis, types of screening equipment <p>Size reduction</p> <ul style="list-style-type: none"> • Crushing and grinding machinery • Introduction to theory of size reduction • Power consumption
III	<p>Drying</p> <ul style="list-style-type: none"> • Classification of dryers • Special drying machinery used in textiles • Equilibrium moisture content, bound, unbound and free water <p>Evaporation</p> <ul style="list-style-type: none"> • Evaporator types and their description, accessories, capacity, heat and material balance, evaluation of boiling point
IV	<p>Distillation</p> <ul style="list-style-type: none"> • Terms and definitions, vapour-liquid equilibrium, boiling point diagrams • Equilibrium distillation, differential distillation and steam distillation
V	<ul style="list-style-type: none"> • Simple treatment of fluid flow • Heat transfer • Heat exchangers

PRACTICALS

TEXTILE PRINTING LAB 1: (6 TC 7)

MM 100

Ex. Hrs: 3

Printing of cotton with various methods viz. blocks, roller and screen by using various classes of dyes.

Printing of cotton fabric with different styles e.g. Direct, Discharge, Resist style etc.

Printing of woolen and silk fabrics.

COMPUTER COLOUR MATCHING LAB: (6TC 8)

MM 100

Ex. Hrs: 3

Experiments based on measuring optical density, transmittance etc.

Study the reflectance curves of various colored samples, munsell color order system and hue, value, chroma, CIE illuminants, standard observers, tristimulus values, chromaticity coordinates, L a b values, K/S values, Strength measurement, whiteness and yellowness index, color difference, metamerism, staining and shade change.

Preparation of primary datas for shade matching, shade correction

PREPARATION OF DYES AND AUXILIARIES : (6TC 9)

MM 100

Ex. Hrs: 3

Preparation of Meta dinitro benzene from Nitro benzene. (Nitration) .

Preparation of Methyl orange from Sulphanic acid. (Diazotization and coupling).

Preparation of Benzoic acid from Toluene.

Preparation of Meta nitro aniline from Meta dinitro benzene.

Preparation of Actanilide from Aniline

Preparation of P-Bromo acitanilide from Acetanilide of Cellulose acetate from cotton waste.

Preparation of Soap from oils. Preparation of Turkey red oil from castor oil.

Preparation of Polyester dyeing carrier. Preparation of softener from Tallow.

Preparation of Cryslyic type and Non cryslyic type Wetting agents.

Preparation of UF resin (MMU, DMU). Preparation of DMDHEU from Glyoxal.

Extraction and purification of natural colours.

Preparation of nonionic and cationic auxiliaries

TEXTILE CHEMICAL ANALYSIS LAB: (6TC10)

MM 100

Ex. Hrs: 3

Identification of dyes on the fibers. Dye purification. Nitrogen estimation, estimation of free and bound formaldehyde spectrophotometrically and iodometrically, Evaluation of wetting agents, leveling agents, silicon emulsion. Fastness of dyes e.g. fastness to light, washing, rubbing, perspiration, sublimation International standards viz. AATCC, ASTM, BIS, ISO.

Evaluation of extent of heat setting.

Degree of mercerization, Barium activity number.

Estimation of mechanical and chemical degradation of cotton, wool, silk, determination of copper number, cup ammonium fluidity, ethylene blue number, CDT, amino end groups in nylon.

Effluent water analysis-Estimation of COD, BOD, oil and grease, iron, sulphide, chloride content etc in effluent water

TEXTILE TESTING LAB-2: (6TC11)

MM 100

Ex. Hrs: 3

Use of microscopes for testing of yarns for appearance, and diameter. Measurement of evenness by conventional and modern testing instruments. Classification of yarn faults, hairiness of yarn interpretation of results and construction of X & R Charts.

Fabric testing for dimensions, construction, weight, thickness, stiffness, crease, drape, busting, cover, shrinkage and air permeability.

Strength testing of fiber, yarn fabric using modern instruments.

Fabrics testing for load elongation, tensile, bursting and tearing strength, abrasion, flexural rigidity, crease recovery and draping qualities of fabrics.

**SEVENTH SEMESTER
B. TECH. (Textile Chemistry)**

DYEING OF SYNTHETICS AND BLENDS**7TC 1)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Classification and developments in disperse dyes • Various auxiliaries used in pet dyeing
II	<ul style="list-style-type: none"> • Pretreatments and dyeing of polyester, pet/cellulose, pet/wool blends by batch, semicontinuous, and continuous dyeing methods • Recent developments in dyeing techniques, problem associated with dyeing of such materials, common faults and their remedies
III	<ul style="list-style-type: none"> • Dyeing of nylon with various classes of dyes , barre and its rectification, dyeing of nylon blends, leveling agents for nylon dyeing • Dyeing of acrylic fiber with new basic dyes, faults and remedy, retarders • Dyeing of micro fiber fabrics, textured yarn and fabrics • Dyeing of new fiber viz Lyocell, Lycra, Modal
IV	<ul style="list-style-type: none"> • Mass coloration of polyester, nylon, acrylics, polypropylene and viscose fibers • Thermosol method of dyeing
V	<ul style="list-style-type: none"> • Dyeing machines for synthetic fibers e.g. high temperature high pressure • Beam dyeing, jet dyeing, soft flow machines • Development in dyeing machines • Dyeing of loose fibers, yarns

TECHNOLOGY OF FINISHING**(7TC 2)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Principle of finishing of cotton, wool, silk • Classification of various finishes • Application of various temporary finishes
II	<ul style="list-style-type: none"> • Various semi permanent, permanent finishes e.g. starch finish, wash and wear, easy care finish, formaldehyde free finishes, anti shrink finish, water repellent finish, water proof finish, rot and mildew proof, soil release, fire retardant finishes for natural fibers
III	<ul style="list-style-type: none"> • Trubensing, Organdee, Zero - finish, softening • Low liquor application techniques like foam finishing
IV	<ul style="list-style-type: none"> • Weighting of silk, scroop finish on silk fabrics • Finishing sequence of woollen textile materials e.g. blankets, shawls, blazers • Moth proofing of woollen materials
V	<ul style="list-style-type: none"> • Finishing machinery's e.g. Stenter, Calendar, Sanforising, Decatising

MAN-MADE FIBRE PRODUCTION**[7TC3]
[Common with 7TT3]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none">• Growth and production of man made fibres in the World and India.• The method of manufacture and mechanism of polymerization and production techniques of polyesters and the staple and multi filament yarn manufacturing process, properties and application areas.
II	<ul style="list-style-type: none">• The method of manufacture and mechanism of polymerization and production techniques of Nylons and the staple and multi filament yarn manufacturing process, properties and application areas.
III	<ul style="list-style-type: none">• The method of manufacture and mechanism of polymerization and production techniques of Acrylics, Mod-acrylics and the staple and multi filament yarn manufacturing process, properties and application areas.• The method of manufacture and mechanism of polymerization and production techniques of polyolifins and the staple and multi filament yarn manufacturing process, properties and application areas.
IV	<ul style="list-style-type: none">• The methods of manufacture and production techniques of regenerated cellulosic fibres like cuprammonium rayon, viscose rayon and modified viscose rayons, the staple and multi filaments yarn manufacturing process, properties and application areas.
V	<ul style="list-style-type: none">• The methods of manufacture and production techniques of regenerated modified cellulosic fibres like acetate rayon, fortisan the staple and multi filaments yarn manufacturing process, properties and application areas.• The methods of manufacture and production techniques of regenerated Protein fibres like casein, ardil, vicara fibres. Their properties and application areas.

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	Yarn geometry <ul style="list-style-type: none"> Idealized yarn geometry Relationship of yarn number and twist factor
II	Packing of fiber in yarn <ul style="list-style-type: none"> Ideal packing, hexagonal close packing and to other forms Packing factor and its measurement Yarn diameter
III	Methods of measurement of twist contraction <ul style="list-style-type: none"> limit of twist, Fiber migration Mechanism of migration Condition for migration to occur Frequency of migration Migration in blended yarns
IV	Translation of fibers properties into yarn properties <ul style="list-style-type: none"> Extension of continuous filament yarn for small strains and large strains Prediction of breakage
V	Mechanics of staple fiber yarns <ul style="list-style-type: none"> The practical and experimental studies Mechanics of staple fiber yarns Hamburger model and later modifications Spin ability of and torsional behavior of Fibers and yarns

POLLUTION CONTROL AND PROCESS HOUSE MANAGEMENT:**(7TC 5)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Hazards in man made fiber production and wet processing Toxicity of dyes, intermediates, auxiliaries, finishing chemicals
II	<ul style="list-style-type: none"> Textile effluent and their characterization, measurement of effluent strength, methods of treatment, disposal and recycling of effluents Environment legislation in India and other countries with respect to dyes and other chemicals
III	<ul style="list-style-type: none"> Balancing of machinery, spacing, material handling Handling of chemicals, processed goods, storing of goods for subsequent operations or for final product Management Information system (MIS) Ventilation and lighting systems
IV	<ul style="list-style-type: none"> Causes of fire, fire fighting and fire prevention Causes of accidents in process houses, safety devices, methods for minimizing accidents Workload studies, Duties and responsibilities of process house staff Administration in process house, wages system
V	<ul style="list-style-type: none"> Costing as an aid to management, elements of costing , control of materials, stores and labor cost Classification and distribution of overheads, depreciation and different system of providing depreciation Variances and budgetary contro Determination of cost per meter of processed goods, Process control in process houses

**ELECTIVE
WET PROCESSING MACHINES**

**(7TC 6)
(7TC6.1)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Functional design of coloration machines – Fiber, lap, Tow and Yarn dyeing machines. Jigger, winches
II	<ul style="list-style-type: none"> Pressure beam, various types jet (fully flooded, partially flooded, TSF) dyeing machines
III	<ul style="list-style-type: none"> Mangles, open-width washers, hydro extractors, vacuum/steam impregnators, singeing machine, continuous bleachers and steamers, mercerize, solvent scouring machines
IV	<ul style="list-style-type: none"> Cylinder dryers, stenter, garment dyeing machines, rotary, flat-bed printing machines, calendars
V	<ul style="list-style-type: none"> Fabric transport devices, synchronization of machinery, Instrumentation and process control, boiler plant and electricity supply

Business Environment and Marketing Management

**[7TC6.2]
[Common with 7TT6.3]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<p>Business</p> <ul style="list-style-type: none"> Changing concept and objective of business, professionalisation business ethics: Social responsibility of business-responsibility to shareholders, employers, consumers and to the community, the Indian situation
II	<p>Environment</p> <ul style="list-style-type: none"> meaning of environment, constituents of business environment ; economic, social political legal and technological environment relation between firm and its environments
III	<p>Management</p> <ul style="list-style-type: none"> Definition, theory's principles of scientific management; Henry Fayol's principles of management and human relations approach functions of management (I) planning (ii)Organizing (iii) Staffing (IV) Directing (v) Controlling
IV	<ul style="list-style-type: none"> Forms of organization structures Line organization; Functional organization Line and staff organization, their merits and demerits
V	<ul style="list-style-type: none"> The marketing process Mean components, factors influencing marketing process Modern marketing process The market concept: Feature and promises of modern marketing concept Marketing management: meanings and importance: marketing mix-A Very brief description of product mix, price mix, distribution mix, and promotion mix.

WET PROCESSING OF WOOL**(7TC6.3)**

Class B.TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none">• Different varieties of wool fibre, natural impurities in wool.• Pretreatments-Scouring, bleaching. Milling, Crabing, Super contraction.
II	<ul style="list-style-type: none">• Dyeing of woolen materials in loose fibre form, top form, hank form, fabric form.• Machines used in dyeing
III	<ul style="list-style-type: none">• Dyeing with various classes of dyes viz. Acid, metal complex, chrome dyes,• Reactive, Natural dyes.
IV	<ul style="list-style-type: none">• Finishing of woolen materials. Application of various finishes e.g. blowing, kier decessing,• Rotary, Super Finish, Paper Press, London shrinkage
V	<ul style="list-style-type: none">• Processing of wool blends –wool/cotton, wool/polyester etc. Flame retardant wool fibre

B. PRACTICALS

DYEING OF SYNTHETIC FIBRES: (7TC 7)

MM :100 Ex .Hrs. 3

Dyeing of various synthetic fibers e.g. polyester, nylon, acrylic blends with various classes of dyes.

FINISHING LAB: (7TC 8)

MM :100 Ex. Hrs. 3

Finishing of cotton, wool, silk, synthetics and blended fabrics.

Finishing of textiles to obtain different effect viz. crease resistance, water repellent, flame retardant, softening, stiffening, soil release, antistatic etc.

Bio polishing of cotton fabrics, tefflon finishes etc.

Study of heat setting and evaluation.

9 PROJECT PART – I (7TC 9)

MM :50 Ex. Hrs. 3

10. MILL TRAINING SEMINAR: (7 TC 10)

MM :100 Ex .Hrs. 3

Detailed study of process sequences and machines involved in the concerning industry, problems occurring and preventive measures taken by the concerned industry.

Inventory control and determination of cost involved in various processing steps.

Utility management viz. water, electricity, power etc .of the concerned industry.

Determination of workload distribution based on production.

EIGHTH SEMESTER
B. TECH. (Textile Chemistry)

TEXTILE AUXILIARIES: (8TC 1)

Class B.TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Detailed classification of textile auxiliaries, various anionic, cationic and nonionic agents
II	<ul style="list-style-type: none"> General methods of preparation and specific uses in textile processing auxiliaries . scouring, bleaching, mercerizing, dyeing and printing auxiliaries
III	<ul style="list-style-type: none"> Physical principles involved in detergency and wetting, HLB numbers Principles of action of auxiliaries based on surface active agents Surface activity, wetting, leveling and dispersing
IV	<ul style="list-style-type: none"> Stripping agents, classification and uses in dyeing Emulsification theory and emulsifying agents Efficiency of wetting agents, sinking time, Herbig number, dispersion and congo rubine number
V	<ul style="list-style-type: none"> Sequestering agents and their utility in processing Eco friendly auxiliaries

FINISHING OF SYNTHETICS AND BLENDS**(8TC 2)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3 Practical : 4	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> Developments in finishing machines Finishing of synthetics and union fabrics e.g. 100% polyester, nylons, acrylics and their blends with cotton, viscose, wool
II	<ul style="list-style-type: none"> Heat setting of various synthetics and union fabrics Weight reduction of polyester fabrics, silk like polyester Finishing of sarees, dress materials
III	<ul style="list-style-type: none"> Mass density, specific weight, relative density, specific volume Antistatic finishes, soil release finishes, water proofing and breathable fabrics Formaldehyde free finishes Durable press finish
IV	<ul style="list-style-type: none"> Flame retardant finishes for polyester, nylon and their blends, FR fibers
V	<ul style="list-style-type: none"> Study of latest finishing chemicals and auxiliaries viz. eco friendly finishes developments in silicone finishes Protective clothing, anti microbial finishes, ballistic protection ,nano- finishing chemicals, plasma treatments, microencapsulation

ENGINEERING OF TEXTILE STRUCTURES- II**[8TC3]****[Common with 8TT3& 8TE3]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Elements of fabric geometry • Cloth setting theories • Fabric cover and fractional cover • Crimp balance equation • Fabric cover and fabric weight relationship
II	<ul style="list-style-type: none"> • Peirce's concept of fabric geometry • Flexible and elastic threads model • Graphical solutions • Latest modifications
III	<ul style="list-style-type: none"> • Translation of fiber and yarn properties into fabric properties, viz. tensile, tearing, abrasion, bending, shearing • Creasing & shearing
IV	<ul style="list-style-type: none"> • Introduction about FAST and KAWABATA Instrument
V	<ul style="list-style-type: none"> • Design of textile structure for certain functional and uses

MATERIALS AND HUMAN RESOURCE MANAGEMENT**(8TC 4.1)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Objectives of material management • Nature and scope of material management
II	<ul style="list-style-type: none"> • Inventory management, inventory control • ABC analysis • Store management • Stock verification • Store accounting
III	<ul style="list-style-type: none"> • Human resource development system • Human resource planning
IV	<ul style="list-style-type: none"> • Human resource development strategies • Man power planning • Concept and process of human resource planning
V	<ul style="list-style-type: none"> • Personnel management environment in India

APPAREL INDUSTRY AND GARMENT PROCESSING**(8TC 4.2)**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Introduction to apparel industry their requirement in Indian Context • Knitwear and garment industry • Factors involved in the study of clothing science
II	<ul style="list-style-type: none"> • Functional description of clothing • Physical properties of clothing and clothing material in relation to the comfort, thermal transmission • Role of environmental conditions in the protective performance of garments
III	<ul style="list-style-type: none"> • Processing of denim garments • Bio polishing • Stone washing
IV	<ul style="list-style-type: none"> • Processing of knitwear garments, dyeing, durable press finish, printing of garments • Limitation of garment processing
V	<ul style="list-style-type: none"> • Garment dyeing machines viz. paddle dyeing, rotary drum and high temperature circulation liquor machines • Quality requirements in fabrics for garments • Quality control in garments

ENTREPRENEURIAL VENTURE & TEXTILE HAZARDS**[8TC4.1]****[Common with 8TT4.1, 8TE4.1]**

Class B. TECH. (Textile Chemistry)	Evaluation
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 100 [Mid-term (20) & End-term (80)]

Units	Contents of the Subject
I	<ul style="list-style-type: none"> • Introduction to entrepreneurial ventures • What is entrepreneurship • Who is entrepreneur
II	<ul style="list-style-type: none"> • Need scope and characteristics of entrepreneurship • Identification of opportunities
III	<ul style="list-style-type: none"> • The need scope and approaches entrepreneurship • Project formulation for different entrepreneurship
IV	<ul style="list-style-type: none"> • Cotton dust disease. of human-being in textile industry • Accidents , causes and safety measures for textile industry
V	<ul style="list-style-type: none"> • Pollution control : Measure to control air and noise pollution in spinning& weaving • Effluent treatment in process house

PRACTICALS

5. DYEING OF SYNTETICS AND BLENDS: (8TC 5)

MM: 100

Exhorts 3

Shade matching of polyester, cotton and blended textiles.
Dyeing on jigger, winch and jet dyeing machines.
Preparation of fancy yarn, vigraux printing.
Matching and shade correction using CCM technique.

6. TEXTILE PRINTING LAB –2: (8TC 6)

MM: 100

Exhorts. 3

Printing of polyester and its blends by using different methods and styles of printing.
Screen preparation for manual and rotary screen printing machines.
Printing of polyester, cotton and its blends by using of Pigment colours.
Evaluation of thicker.

7. PROJECT PART - II (8TC 7)

MM: 200

8. SEMINAR: (8TC 8)

MM: 100

9. ADVANCED EXPERIMENTS IN DYEING: (8TC 9)

MM: 50

Exhorts. 3

Determination of dyeing kinetics, diffusion coefficient, exhaustion percentage by optical density methods.
Effect of system variable parameter on exhaustion percentage of dyes.
