

**DKTE Society's
TEXTILE & ENGINEERING INSTITUTE**

Rajwada, Ichalkaranji 416115

(An Autonomous Institute)

DEPARTMENT: TEXTILES

CURRICULUM

B. Tech. Textile Chemistry Program

Second Year

With Effect From

2017 - 2018



Promoting Excellence in Teaching
Learning & Research

**Second Year B. Tech. Textile Chemistry
Semester-I**

Sr. No.	Course Code	Name of the Course	Group	Teaching Scheme				Credits
				Theory Hrs/ Week	Tutorial Hrs/ Week	Practical Hrs/ Week	Total	
1	TCL201	THERMAL ENGINEERING	B	3			3	3
2	TCL202	TEXTILE MATHEMATICS - III	A	3			3	3
3	TCL203	POLYMER SCIENCE	B	3			3	3
4	TCL204	CHEMISTRY OF FIBRES - II	D	3			3	3
5	TCL205	SPINNING TECHNOLOGY	D	3			3	3
6	TCL206	TECHNOLOGY OF PRETREATMENT - I	D	3			3	3
7	TCP207	CHEMISTRY OF FIBRES – II LAB	D			2	2	1
8	TCP208	SPINNING TECHNOLOGY LAB	D			2	2	1
9	TCP209	TECHNOLOGY OF PRETREATMENT – I LAB	D			2	2	1
10	TCP210	TEXTILE DESIGN AND COLOUR LAB	D		2		2	2
11	TCL211	ENVIRONMENTAL STUDIES - I	C	2			2	2 Units
		Total		20	2	6	28	23

Group Details

- A: Basic Science
 B: Engineering Science
 C: Humanities Social Science & Management
 D: Professional Core Courses & Professional Elective
 E: Free Elective
 F: Seminar/Training/ Project

Second Year B. Tech.
TCL201: THERMAL ENGINEERING

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

Course Objectives

1. To understand basics of Thermodynamics, Thermodynamics 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 performance 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.

Course Outcomes

At the end of the course students will be able to

1. 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. 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. 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. Describe construction and working of various types of compressors, pumps and their applications in textile industry. To draw symbols for pneumatic systems.

Course Contents**Hrs.**

Unit 1.	<p>Introduction to Thermodynamics and Air standard cycle.</p> <p>a) 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.</p> <p>b) Air standard cycle: Introduction, assumptions in thermodynamic cycles, terms used in thermodynamic cycles, efficiency of a cycle, representation of Carnot cycle, Otto cycle, Diesel cycle on P-V and T-S</p>	10
----------------	--	-----------

- diagram and numericals based on the same.
- Unit 2. 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. 6
- Unit 3. Steam boilers, mountings & accessories:**
a) Steam boiler: Introduction, classification of boilers, Important terms for steam boilers, essentials of good steam boiler, selection of a steam boiler, construction & working of fire tube boilers such as Cochran boiler, Locomotive boiler, construction & working of water tube boiler such as Babcock & Wilcox boiler, equivalent evaporation, efficiency of boiler & numericals based on the same. 8
b) Boiler mountings & accessories: Mountings - safety valve – dead weight safety valve, lever safety valve, spring loaded safety valve, water level indicator, fusible plug, steam pressure gauge, feed check valve, stop valve, blow off cock. Accessories – feed water pump, injector, economizer, super heater.
- Unit 4. 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. 2
- Unit 5. Refrigeration and Air Conditioning**
a) Refrigeration: Introduction, 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.
b) 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, hair type humidistat. 7
- Unit 6. Pumps, Compressors and Introduction to Pneumatics:**
a) Pumps & Compressors: Pumps – reciprocating, centrifugal (construction and working principle). Compressors - classification, reciprocating, rotary - vane & screw compressor, centrifugal compressor,

axial flow compressor.

6

b) Introduction to Pneumatics:

Pneumatic Circuits – symbols of cylinder, control valves, check valves.

Air treatment – symbols for air filter, refrigerated dryer, lubricators,

Control valves – symbols for poppet valve, pilot operated check valve and spool valve. 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. A course in Refrigeration & Air conditioning by Arora &Domkundwar.
4. Refrigeration & Air conditioning by R. K. Rajput.
5. Pneumatic Systems by Majumdar.
6. Hydraulics & Pneumatics by Andrew & Parr.
7. Humidification & Air conditioning by S. P. Patel.
8. Textile Humidification by K. G. Vaze.

Second Year B. Tech.
TCL202: TEXTILE MATHEMATICS-III

Teaching Scheme	
Lectures	3 Hrs./Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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 (χ^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.

Course Outcomes

At the end of the course students will be able to

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.

Course Contents

Unit 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-Kuttamethod of fourth order.	8 Hrs.
Unit 2.	Linear differential equations of nth 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 their solution.	7 Hrs.
Unit 3.	Applications of ordinary and linear differential equations: Applications for solving simple electrical circuit problems and mechanical problems	4 Hrs.
Unit 4.	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.	7 Hrs.
Unit 5.	Small sample tests and estimation	8 Hrs.

Test for population mean, equality of population means, population variance, equality of population variance. Test for goodness of fit and independence of attributes. Point Estimation, unbiased estimators of population mean and variance. Interval Estimation, Confidence Interval for population mean based on normal and 't' distributions.

Unit 6. Statistical quality Control

5 Hrs.

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. 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 Montgomery &Runger
6. Probability & Statistics for Engineers by Johnson

Second Year B. Tech
TCL203: POLYMER SCIENCE

Teaching Scheme	
Lectures	3Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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.
4. To explain the concept of molecular weight of polymers and polymer degradation.

Course Outcomes

At the end of the course students 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.
4. Understand the concept of molecular weight of polymers and polymer degradation.

Course Contents

	Hrs.
<p>Unit 1. 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.</p>	06
<p>Unit 2. Condensation Polymerization Mechanism, types, feasibility, 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.</p>	06
<p>Unit 3. Addition polymerization Mechanism, types, features and essential requirements of addition polymerization. Types of initiation, chemistry of initiators, retarders and</p>	06

inhibitors. Effect of catalyst, temperature, pressure, solvents, modifiers, emulsifying and suspending agents on addition polymerisation. Kinetics of addition polymerisation. Industrial applications of addition polymerisation.

Unit 4. 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 copolymerization. Concept of ideal, alternating and azeotropic co-polymerisation. Reactivity ratios of monomers and its significance. Concept of Q-e scheme. Kinetics of co-polymerisation.6

06

Unit 5. Techniques of polymerization

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

04

Unit 6. Molecular Weight and Polymer Degradation

Concept of Mn, Mw and poly-dispersibility& their significance. Effects molecular weight distribution of polymer on spinnability&drawability. Light scattering and ultra-centrifuge techniques to determine Mw. Endgroup analysis, osmotic pressure, cryoscopic methods & viscosity methods to determine Mn& Mw. Characteristics of polymer using DSC, TGA, DTA, DMA and GPC. Concept of chain end and random polymer degradation. Study of polymer degradation by thermal, mechanical, chemical and other agencies.

11

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&JaydevShreedhar.

Second Year B. Tech
TCL204: Chemistry of Fibres - II

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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

Course Outcomes

At the end of the course students will be able to

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

Course Contents**Hrs.****Unit 1. Fundamentals of Fibre Spinning:-**

General principles of the spinning process, Theory of solidification of polymer in various spinning techniques. 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, Concept of high-speed spinning. Concept of LOY, MOY, POY, HOY, FOY yarns, Spin draw process, Concept of Direct melt spinning, Concept of microfibres and nanofibres.

10

Unit 2. Polyester Fibre:-

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),

8

	Polybutylene terephthalate (PBT).}	
Unit 3.	Polyamide Fibre:- 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.	7
Unit 4.	Acrylic Fibre :- 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.	6
Unit 5.	Polyolefin Fibre:- Raw materials, manufacturing process, physical and chemical properties of polypropylene and polyethylene, various applications of Polyolefin fibre.	5
Unit 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.	3

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. Synthetic Fibers by Franz Fourne
9. Polyesters and polyamides Edited by B. L. Deopura, R. Alagirusamy, M. Joshi and B. Gupta

Second Year B. Tech
TCL205: Spinning Technology

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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.

Course Outcomes

At the end of the course students 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 processes.
3. Understand the ring spinning and yarn doubling process.
4. Illustrate the principles and manufacturing processes of unconventional yarns.

Course Contents		Hrs.
Unit 1.	A) Cotton Fibre Cultivation & Ginning: <ul style="list-style-type: none"> ▪ Cotton cultivation in India. ▪ Definition of picking and types of picking, their effect on cotton quality • Definition of Ginning and types of Ginning. B) Yarns Numbering System: <ul style="list-style-type: none"> ▪ 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. C) Processflow charts: <ul style="list-style-type: none"> ▪ Conversion of staple fibres into Carded / Combed / Rotor / Air-jet yarn 	07
Unit 2.	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).	07
Unit 3.	A) Carding – Objects of carding, Study of card, Introduction to carding and stripping action. Passage of material through carding. Production Calculation. B) Draw frame – Concept of drafting, requirement of doubling, objects of draw frame. Working of Draw frame. Calculations.	08
Unit 4.	Comber Preparatory and Comber:	06

- 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.
- Unit 5.** **A) Speed frame** – Object of speed frame. Passage of material through speed frame. Production Calculations.
- B) Spinning**
- a. Ring Frame** – Objectives of ring frame, Passage of material through ring frame, Ring yarn properties, Production Calculations. 07
- b. Yarn Doubling** – Objects, Passage of material through yarn doubling machine.
- Unit 6.** **Unconventional Spinning Systems:-**
- Advantages and limitations of ring spinning system
 - Introduction to following unconventional spinning techniques. 04
 - a. Compact spinning system.
 - b. Rotor spinning system.
 - c. Air Jet spinning system.
 - Properties of yarns produced on above systems.

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

Second Year B. Tech**TCL206: TECHNOLOGY OF PRE-TREATMENTS - I**

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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 mercerising machinery and techniques of batch and continuous method of pre-treatment

Course Outcomes

At the end of the course students will be able to

1. Formulate sizing recipe for various yarn counts and fibres.
2. Formulate suitable recipe for pre-treatments of various fibre and fabrics.
3. Identify the pre-treatment 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 pre-treatments.

Course Contents**Hrs.****Unit 1. SIZING**

Importance and objects of sizing, Sizing ingredients and their functions. Adhesives and their classification. Introduction of 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 with different counts. Concept of size pick up, % add on, its importance in weaving. Tests for size identification

07**Unit 2. GREY INSPECTION**

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

06**MECHANICAL CLEANING PROCESSES**

Objects of shearing and cropping process, working principle and features

	of shearing and cropping machine, Objects of singeing, Methods of singeing, Details of gas singeing machine. Singeing of yarn, woven, knit, synthetic and blended fabrics, Evaluation of the efficiency of singeing.	
Unit 3.	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.	06
Unit 4.	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. Concept of Bio-Scouring Evaluation of the efficiency of scouring	06
Unit 5.	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	07
	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	
Unit 6.	INTRODUCTION TO MERCERIZATION Objects of Mercerization, Various changes brought about by mercerization, Various factors affecting the process of mercerization Concept of Hydrate formation & various types of cellulose conversions, Various stages of mercerization & their comparison; Evaluation to test efficiency of mercerization	07

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.

Second Year B. Tech
TCP207: CHEMISTRY OF FIBRES – II LAB

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	100

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. Identification of fibres from binary blend by chemical method – III.
5. Identification of fibres by microscopic method.
6. Quantitative analysis of given known blend – I.
7. Quantitative analysis of given known blend – II.
8. Quantitative analysis of given known blend – III.
9. Determination of accessible region of polyester by Iodine absorption method.
10. Demonstration of laboratory melt spinning unit and production of filament yarn.
11. Demonstration of laboratory filament yarn drawing machine and drawing & heat setting of polyester POY.
12. Detection of damage of synthetic fibres.

Submission

1. Completed Journal

Second Year B. Tech
TCP208: SPINNING TECHNOLOGY LAB

Teaching Scheme		Evaluation Scheme	
Practical	2 Hrs. /Week	CIE	50
Total Credits	1	Total	50

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.

Submission

1. Completed Journal

Second Year B. Tech**TCP209: TECHNOLOGY OF PRE-TREATMENTS – I LAB**

Teaching Scheme	
Practical	2 Hrs./week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	100

List of Experiments

1. Testing of adhesives used in sizing
2. Testing of softeners used in sizing
3. Desizing of Cotton by various methods
4. Scouring of Cotton
5. Solvent assisted scouring of Cotton fabric
6. Bio-Scouring of Cotton
7. Bleaching of Cotton fabric using Sodium Hypochlorite
8. Bleaching of Cotton fabric using Hydrogen Peroxide
9. Determination of Whiteness index, yellowness index, Absorbency and Ash-Content of grey, bleached and OBA treated fabric
10. Determination of Copper number
11. Determination of Carboxyl group content
12. Bleaching of Cotton using potassium permanganate and per-acetic acid

Submission

1. Completed Journal

Second Year B. Tech.**TCP210: TEXTILE DESIGN AND COLOUR LAB**

Teaching Scheme	
Tutorial/Drawing	2 Hrs / Week
Total Credits	2

Evaluation Scheme	
CIE	50
SEE	--
Total	50

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.

Course Outcomes

At the end of the course students will be able to

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

List of Experiments

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.
5. Principle of Alteration - Change in colour, Change in size, Change in direction, Permutation and combination. (Any one of list.)
6. Principle of Grade, Harmony, Balance, Contrast.(Any one of list.)
7. Principle of Dominance.
8. Composition of textile design by - Rectangle base.
9. Drop base – half drop or full drop.
10. Diamond base, Ogee base, Sateen base.(Any one of list)
11. Development of textile design for screen printing.
12. Study of printing software.

Submission

1. Completed Journal.

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, Woodhead Publishing Limited.

Second Year B. Tech.
TCL211: ENVIRONMENTAL STUDIES- I

Teaching Scheme	
Lectures	2 Hrs. /Week
Audit Points	2

Evaluation Scheme (Annual evaluation in Sem. IV)	
SEE	70
CIE (Project)	30
Total	100

*Evaluation of the course will be in Sem. IV based on syllabus of Sem. III and Sem. IV

Course Objectives

1. Introduce students to multi-disciplinary nature of Environment sciences and its importance
2. To create awareness about present Environmental problems and their root causes
3. Understand action needed for environment conservation for present and future
4. Introduction to sustainability and resource conservation

Course Outcomes

At the end of the course students will be able to

1. Explain various concepts in Environmental sciences
2. Describe collective responsibility towards conservatory approach
3. Explain importance of mass awareness and individual role in pollution prevention
4. Analyze social issues and local environmental problems and suggest solutions

Course Contents		Hrs.
Unit 1.	Nature of Environmental Studies Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness	06
Unit 2.	Natural Resources and Associated Problems: Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people. Mineral resources: Usage and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides soil erosion and desertification. Role of an individual in conservation of natural resources	10
Unit 3.	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem - Forest ecosystem. Grassland ecosystem.	10

Desert ecosystem. Aquatic ecosystems (Ponds, Lakes). Aquatic ecosystems (Lakes, Rivers). Aquatic ecosystems (Streams, Oceans, Estuaries).

Reference Books

1. Environmental Studies, Publisher Shivaji University Kolhapur
2. Environmental Studies, by Tiwari et al/publisher IK International New Dehli
3. Environmental Studies by Dr. A Kaushik New Age International publisher New Dehli
4. Environmental Biology by KC Agarwal Nidi Pub. Ltd Bikaner
5. Ecology and Environment by PD Sharma Rastogi Publication Meerut
6. Essentials of Ecology, Townsend C., Harper, J. and Michael Begon, Blackwell Science (TB)

**Second Year UG Program in Textile Chemistry
Semester-II**

Sr. No.	Course Code	Name of the Course	Group	Teaching Scheme				Credits
				Theory Hrs/ Week	Tutorial/ Drawing Hrs/ Week	Practical Hrs/ Week	Total	
1	TCL212	TEXTILE ELECTRONICS	B	4			4	4
2	TCL213	TEXTILE MATHEMATICS - IV	A	3			3	3
3	TCL214	CHEMICAL ENGINEERING OPERATION	D	3			3	3
4	TCL215	CHEMISTRY OF DYES AND PIGMENTS	D	3			3	3
5	TCL216	WEAVING AND KNITTING TECHNOLOGY	D	3			3	3
6	TCL217	TECHNOLOGY OF PRETREATMENTS - II	D	3			3	3
7	TCP218	TEXTILE ELECTRONICS LAB	B			2	2	1
8	TCP219	CHEMISTRY OF DYES AND PIGMENTS LAB	D			2	2	1
9	TCP220	WEAVING AND KNITTING TECHNOLOGY LAB	D			2	2	1
10	TCP221	TECHNOLOGY OF PRETREATMENTS – II LAB	D			2	2	1
11	TCP222	ENVIRONMENTAL STUDIES - II LAB	C		2		2	1 Unit
		Total		19	2	8	29	23

Group Details

- A: Basic Science
 B: Engineering Science
 C: Humanities Social Science & Management
 D: Professional Core Courses & Professional Elective
 E: Free Elective
 F: Seminar/Training/ Project

Second Year B. Tech.
TCL212: TEXTILE ELECTRONICS

Teaching Scheme	
Lectures	4 Hrs. /Week
Total Credits	4

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

Course Objectives

1. To explain the operation and applications of semiconductor devices, power semiconductor devices and electromechanical devices.
2. To describe working principle of different types of sensors and transducers.
3. To explain working of digital circuits, microprocessor, microcontroller and PLC
4. To demonstrate applications of electronics in textiles.

Course Outcomes

At the end of the course students will be able to

1. Describe operation and application of semiconductor devices, power semiconductor devices and electromechanical devices.
2. Explain working principle of different types of sensors and transducers.
3. Explain working of digital circuits, microprocessor, microcontroller and PLC
4. Demonstrate applications of electronics in textiles.

Course Contents**Unit 1. Basic Electronics and Semiconductor devices 12 Hrs.**

Electronics components, passive components, resistors, capacitors and inductors

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.

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

Unit 2. Op-amp and power semiconductor devices 10 Hrs.

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, SCR construction, operation, turning ON and OFF of SCR, SCR characteristics, Triac- Construction, working and characteristics, diac- Construction, working and characteristics, SCR in DC Motor speed

control, AC power control using triac, power MOSFET, IGBT, power modules

- Unit 3. Transducers and electromechanical devices** **12 Hrs.**
 Introduction, transducer classification – Primary and secondary transducers, active and passive transducers, analog and digital transducers, basic requirements of transducers
 Classification of optoelectronic devices- emitters, sensors, optocouplers; photodiode, phototransistor, LDR, photo voltaic cell, LED, optocouplers, optical shaft encoders
 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
 Electromechanical Devices- Relay, Solenoid Valve
- Unit 4. Digital Electronics** **8 Hrs.**
 Difference between analog and digital electronics, digital gates, 4:1 multiplexer, 1:4 demultiplexer, 3:8 decoder, 8:3 encoder, level triggered RS flip flop, edge triggered D and JK flip flop, asynchronous up and down counter, 4-bit register, memory & its types
- Unit 5. Microprocessor, Microcontroller and PLC** **5 Hrs.**
 8085 microprocessor features, pin diagram and architecture;
 8051 microcontroller features, block diagram; PLC block diagram
- Unit 6. Automation in Textiles** **5 Hrs.**
 Automatic textile control systems- feedback, feed forward and combined; applications of electronics in spinning, weaving, testing and finishing

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, DhanpatRia and Sons Pub.
5. Instrumentation Devices & Systems by C.S. Rangan, G.R. Sharma, TMH Pub
6. Op-amp and Linear Integrated Circuits by RamakantGaykwad
7. Digital Principles and applications by Malvino and leach
8. Microprocessor Architecture, Programming and applications with 8085 by Ramesh Gaonkar.
9. The 8051 Microcontroller Architecture, Programming and Applications by Kenneth J, Ayala.
10. Electronic Controls for Textile Machine – Hiren Joshi and Gouri Joshi, NCUTE
11. 8085 Microprocessor by Vibhute&Borole

Second Year B. Tech.
TCL213: TEXTILE MATHEMATICS-IV

Teaching Scheme	
Lectures	3 Hrs./week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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

Course Outcomes

At the end of the course students will be able to

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.

Course Contents

Unit 1.	Laplace Transforms and its application to L.D Equations Definition, transforms of standard functions, transforms of derivatives, and integrals. Inverse Laplace transforms by partial fraction and convolution method. Application for L.D. equations, Method of solving L.D. equations with initial conditions (Boundary Values).	8 Hrs.
Unit 2.	Vector differentiation Differentiation of vector valued function of scalar 't', gradient, divergence, curl, directional derivative. 'Solenoidal' and 'Irrotational' vector fields.	5 Hrs.
Unit 3.	Fourier Series Definition, Euler's formulae, Conditions for Fourier expansions. Full range fourier series and half range expansions and their examples.	6Hrs.
Unit 4.	Analysis of Multivariate Data Multiple correlation coefficients. Partial correlation coefficients. Planes of regression.	4 Hrs.
Unit 5.	Analysis of Variances: Introduction, One-way analysis of variance, Two-way analysis of variance with and without repetition.	8 Hrs.
Unit 6.	Basic designs and factorial experiments	8 Hrs.

Introduction, Basic principles, Basic Designs (CRD, RBD & LSD).
Introduction and types of factorial experiments, 2^n factorial experiments,
 2^2 & 2^3 factorial experiments.

Reference Books

1. A textbook of applied mathematics Vol.-I & II by P.N. & J.N. Wartikar.
2. Higher engineering mathematics by B.S. Grewal.
3. A textbook of applied mathematics by Bali, Saxena&Iyengar.
4. Mathematical Statistics by J.E. Freund.
5. Probability & Statistics for engineers by Johnson.
6. Statistical methods by Kumbhojkar

Second Year B. Tech.
TCL214: Chemical Engineering Operations

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

Course Objectives

- 1 Describe various unit operations; basics of mass transfer and their related theories.
- 2 Illustrate application and calculation of drying in textile wet processing.
- 3 Illustrate application and calculation of size reduction, mixing and mechanical separation.
- 4 Describe various filtration techniques and related applications.

Course Outcomes

At the end of the course students will be able to

1. Explain various unit operations; basics of mass transfer and their related theories.
2. Illustrate application and calculation of drying in textile wet processing.
3. Illustrate application and calculation of size reduction, mixing and mechanical separation.
4. Explain various filtration techniques and related applications.

Course Contents

		Hrs.
Unit 1.	Mass Transfer and Unit operations Introduction to the chemical engineering. Definition and classification of mass transfer operations. Definition and classification of diffusion. Fick's law of diffusion. The concepts of diffusion rate, diffusion coefficient and diffusivities. Relevance of mass transfer studies to textiles. Difference between unit operations and unit processes. Study of different unit operations of chemical engineering like distillation, extraction, absorption, adsorption, evaporation, crystallization with respect to their concept, principle of separation, types, performance analysis and applications from textile industry view point.	06
Unit 2.	Drying Introduction, concept of drying. Definition, principle and purposes of drying. Concept of simultaneous heat and mass transfer operations. Equilibrium relationship, rate of drying. Heat and mass balance of drying operation. Heat capacities of textile materials. Theory of drying. Relevance of drying to textile industry. Principle and operation of various textile dryers like drum dryer, tumble dryer, stenters, study of new drying techniques like IR, RF drying. Numericals based on above	08
Unit 3.	Size Reduction	06

Brief introduction to mechanical operations. Definition of size reduction operations, classification of size reduction equipments. Concept of crushing efficiency and work index. Laws of crushing and grinding. Applications of the size reduction operations. Principle and operation of a ball mill.

Unit 4. Mechanical separation and mixing

Importance of the screening of size reduced materials. Concept of particle size, particulate matter. Introduction to sieve analysis. Screen efficiency, screen effectiveness. Simple numericals based on above.

06

Brief study of mixing operation. Need of liquid mixing in textiles. Brief study of mixing performance analysis. Classification of mixing equipments

Unit 5. Filtration

Introduction to filtration operation. Concept of filter media, filter aids, various types of filters used in textiles, advantages and uses of filtration operation. Applications of filtration operation to textiles. Working principle of filtration equipment. Simple numericals based on rate of filtration.

07

Definition and need of settling processes. Types and applications of settling process in reference to textile processing industry.

Unit 6. Membrane separation techniques

Introduction, types of membranes, Merits and demerits of these operations over the conventional mass-transfer operations. Principle of operation, separation size range, rate expressions and applications of the membrane technologies like reverse osmosis, dialysis, electro-dialysis, ultra-filtration, micro filtration.

06

Reference Books

1. Mass Transfer Operations by Treybal, McGrawHill publication. (1955)
2. Introduction to Chemical Engineering, by Badger and Banchero, McGraw Hill publication (1955)
3. Transport Phenomena by Beek and Muttzall, Byron Bird R., Wiley publication. (1975).
4. Theory of Coloration of Textiles by Bird and Boston, Dyers Company Publications Trust, (1975).
5. The Physical Chemistry of Dyeing, Volume-III, by R.H. Peters, Elsevier publication (1975).
6. Chemical Engineers Handbook, by Perry, McGraw-Hill publication.
7. Unit Operations in Environmental Engineering by R. Elangovan, M. K. Saseetharan, New Age International (P) Ltd., Publishers.
8. Coulson and Richardson's Chemical Engineering Volumes 1-6, Asian Books Pvt. Ltd.

Second Year B. Tech.
TCL215: CHEMISTRY OF DYES AND PIGMENTS

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

Course Objectives

- 1 Describe light, colour and chemical constitution
- 2 Describe dye intermediates and its manufacturing, classification of colouring matters, with their nomenclature and colour index.
- 3 Describe dye fibre interaction and aspects of dyeing.
- 4 Describe salient features of dyes with their mechanisms.

Course Outcomes

At the end of the course students will be able to

1. Illustrate colour and chemical constitution
2. Understand dye intermediates and its manufacturing with classification of colouring matters, and their nomenclature and use of colour index.
3. Illustrate dye-fibre interactions and aspects of dyeing.
4. Demonstrate salient features of dyes with their mechanisms.

Course Contents**Hrs.****Unit 1. Colour and chemical constitution**

Properties of electromagnetic radiation, its interactions with matter, visible spectrum, viewing of colour, additive and subtractive theories of colour; Relationship between colour and chemical constitution – Witt's theory, valence bond theory and molecular orbital theory.

7

Unit 2. synthetic dyes

Concept of dye, colour and pigment; Classification of dyes and pigments: according to the method of application and chemical structure.

7

Destructive distillation of coal tar and its products as primaries, intermediates, their importance and basic reactions of involved in dye manufacturing.

Unit 3. Preparation of Dyes

Preparation of Nitro dyes, Azo dyes, Stilbene dyes, DPM and TPM dyes, Anthraquinone dyes.

6

Concept of fluorescent dyes, thermo-chromic dyes, photo-chromic dyes.

Unit 4. Elements of Dyeing	
Concept of substantivity and affinity of dyes, percentage shade, liquor ratio, solubility and dissolution of dyes, aggregates of dyes, exhaustion, expression.	6
Dyeing assistants like water softeners, exhausting agents, levelling and retarding agents, effect of temperature on dyeing.	
Unit 5. Mechanism of Dyeing	
General application method – exhaust and padding; Mechanism of dyeing; dye-fibre interactions	
Relationship between - chemical structure and substantivity; chemical structure and fastness properties.	6
Compatibility of dyes in combination shades.	
Concept of colour index and its significance. Nomenclature of dyestuffs.	
Unit 6. Dyes for Cellulosic, Synthetic and other fibres:	
Classification, salient features, mechanism, steps involved in dyeing and properties of Direct, Reactive, Vat, Sulphur dyes and Azoic colours.	7
Classification, salient features and dyeing mechanism of - Disperse dyes on Polyester. Acid dye, Basic dyes on amide fibres	

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. Basic Principles of Textile Colouration by Arthur D Broadbent, SDC
10. Chemical processing of synthetic fibres by Dr. K. V. Datye & A. A. Vaidya

Second Year B. Tech.

TCL216: Weaving and Knitting Technology

Teaching Scheme	
Lectures	3 Hrs./Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

Course Objectives

1. To define basics of fabric forming.
2. To explain functions, 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 explain the method of fabric forming by warp knitting and weft knitting, fabric structure and calculations
4. To explain the method of interlacement for warp and weft for different weaves such as plain, twill, satin, honeycomb, huck-a-back and mock-leno

Course Outcomes

At the end of the course students will be able to

1. Explain basics of fabric forming.
2. Describe the functions, working and to do calculations of various weaving processes such as winding, pirn winding, warping, sizing, drawing in, and weaving machines (plain, auto and shuttleless).
3. Classify the method of fabric forming by warp knitting and weft knitting, fabric structure and calculations
4. Analyse the method of interlacement for warp and weft for different weaves such as plain, twill, satin, honeycomb, huck-a-back and mock-leno

Course Contents

	Hrs.
Unit 1. Introduction: Methods of fabric forming such on weaving, knitting and non-woven. Brief general discussion about processes involved in these methods. Basic terminologies like Warp, Weft, End, Pick, Selvage etc., Flow chart for grey, stripped and checks fabrics	03
Unit 2. Weaving Preparatory: Winding: Object and passage of yarn through Winding machine, Functions of various important parts like creel, tensioner, clearer, winding drum. Features of automatic winding machine.	07
Warp Preparatory: I. Warping: Objects and passage of yarn through Beam Warping Machine. Objects and need of Sectional Warping Machine. Process of sectional warping and Beaming.	

- II. **Sizing:** 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.
- III. **Drawing in and Denting:** Objects of drawing in and denting process.

Weft Preparation:

Objects of pirn winding machine and passage of yarn through machine

Unit 3. 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.

- I. **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
- II. **Picking:** Objects, types and working of Over-pick & Under-pick mechanism.
- III. **Beat Up:** Objects, construction and working of beat up motion. Eccentricity of sley. Functions of reed, Reed count.
- IV. **Secondary Motions:** Objects, construction and working of Negative Let off, Seven Wheel Take Up motion
- V. **Auxiliary Motions:** Objects, construction and working of Weft Stop Motion, Warp protecting motion, Temple, Brake, backrest.
- VI. **Dobby Shedding:** Functions and applications of Climax Dobby
- VII. **Jacquard Shedding:** Principle of Jacquard shedding.
- VIII. **Drop Box:** Functions and applications of 4x1 Drop box
- IX. Limitations of Shuttle Loom.
- X. Features of Automatic Loom
- XI. **Shuttleless looms:** Principles of picking of Projectile, Rapier, Air Jet and Water Jet.

15

Unit 4. Knitting:

- I. Comparison of Knitting with Weaving.
- II. Knitting cycle for weft knitting.
- III. Types of stitches and their functions.
- IV. Representation of structure on point paper.
- V. Structure of single jersey, Rib & Interlock fabrics.
- VI. Warp Knitting process its fabric applications.

04

Unit 5. Fabric Structure:

Methods of representation of warp and weft interlacement on graph paper. Design, draft, peg plan and denting order

- I. **Plain Weave:** Features and structure of weave, Derivatives of plain weave and its structure.
- II. **Twill Weave:** Features, Types of twill weave and its structure
- III. **Satin/Sateen weave:** Features, Types of weave and structure of satin/sateen weave.
- IV. **Towel weave:** Features, Types of towel weave and its structure
Honey comb, Huck a back & Mock leno

07

Unit 6. Calculations:

- I. **Weaving and its preparatory:** Production calculation for winding, warping, loom
- II. **Knitting:** Production calculation of single jersey circular weft knitting machine
- III. **Fabric weight:** woven and knitted fabrics

03

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 publication.
7. Knitting by Prof. D.B. Ajgaonkar.
8. Sizing by D. B. Ajgaokar
9. Principles of weaving by Marks and Robbinson
10. Weaving machines, mechanism, management by Talukdar, Srimalu and Ajgaonkar
11. Industrial Practices in Weaving Preparatory by Dr. M. K. Singh
12. Fundamentals and Advances in Knitting Technology by Sadhan Chandra Roy
13. Fundamentals of Yarn Winding by Milind Korane

Second Year B. Tech
TCL217: TECHNOLOGY OF PRE-TREATMENTS – II

Teaching Scheme	
Lectures	3 Hrs. /Week
Total Credits	3

Evaluation Scheme	
SE-I	25
SE-II	25
SEE	50
Total	100

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

Course Outcomes

At the end of the course students will be able to

1. Decide preparatory process sequence for knit goods and protein fibres
2. Understand the various factors to be considered while processing synthetic and specialty fabrics
3. Understand processing of terry towel and denim
4. Understand significance of bio technology & explain process of mercerization, machinery used

	Course Contents	Hrs.
Unit 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	07
Unit 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	06
Unit 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.	07

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	
Unit 4.	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.	
	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	06
Unit 5.	MERCERIZATION, UNCONVENTIONAL MERCERIZING & MACHINES Overview of mercerizing process, 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	06
Unit 6.	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	07

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 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
9. Textile Chemical Processing (Vol. 1) by Jitendra Kumar

Second Year B. Tech.
TCP218: TEXTILE ELECTRONICS LAB

Teaching Scheme	
Practical	2 Hrs. /Week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	100

List of Experiments

1. Forward and reverse bias characteristics of diode.
2. Half wave rectifier (with and without filter).
3. Full wave rectifier (with and without filter).
4. Reverse characteristics of zener diode.
5. Op-amp inverting and non-inverting amplifier.
6. AC power control using triac.
7. LDR characteristics.
8. Speed measurement using optical and magnetic pickups.
9. RTD characteristics
10. Weight measurement using strain gauge.
11. Realization of digital gates
12. 8085 assembly language program

Submission

1. Completed Journal

Second Year B. Tech**TCP219: CHEMISTRY OF DYES AND PIGMENTS LAB**

Teaching Scheme	
Practical	2 Hrs./week
Total Credits	1

Evaluation Scheme	
CIE	50
SEE	50
Total	100

List of Experiments

1. Estimation of aniline by diazotization method
2. Estimation of Sulphanilic acid by diazotization method
3. Identification of dyes on fibres
4. Identification of dyes on fibres
5. Identification of dyestuffs
6. Identification of dyestuffs
7. Comparative estimation of strength of the given dye by dyeing method
8. Comparative estimation of strength of the given dye by Optical method
9. Dyeing of cotton with direct dyes with differential MLR
10. Dyeing of cotton with reactive dyes with differential concentration of salt
11. Dyeing of cotton azoic colours
12. Dyeing of cotton with vat dye

Submission

1. Completed Journal

Second Year B. Tech.
TCP220: WEAVING AND KNITTING TECHNOLOGY LAB

Teaching Scheme	
Practical	2 Hrs./Week
Total Credits	1

Evaluation Scheme	
CIE	50
Total	50

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. Study of the primary motions and secondary motions on loom
5. Study of auxiliary motions.
6. Study of doobby (climax).
7. Study of Jacquard shedding mechanism
8. Study of Drop box motion
9. General study of features of Automatic looms (Cimmco&Ruti).
10. General study of shuttleless looms- projectile, rapier & air jet looms.
11. General study of circular weft knitting machine.
12. Fabric Analysis: - Woven fabrics samples of Plain, Twill, Satin, Sateen and Towel weaves (Mock leno, Huck a back and Ordinary Honey comb)

Submission

1. Completed Journal

Second Year B. Tech**TCP221: TECHNOLOGY OF PRE-TREATMENTS – II LAB**

Teaching Scheme	
Practical	2 Hrs./week
Total Credits	1

Evaluation Scheme	
CIE	50
Total	50

List of Experiments

1. Degumming and bleaching of silk
2. Scouring and bleaching of wool
3. Scouring and Bleaching of terry towels
4. Scouring and bleaching of cotton knitted fabric
5. Scouring and bleaching of Linen
6. Woollenization of Jute
7. Scouring and bleaching of Jute
8. Pre-treatment of polyester and its blends
9. Pre-treatment of Lycra and its blends
10. Desizing of Denim
11. Mercerization of cotton
12. Evaluation of Mercerised goods

Submission

1. Completed Journal

Second Year B. Tech.
TCP222: ENVIRONMENTAL STUDIES- II LAB

Teaching Scheme	
Lect/ Tut/ Proj	2 Hrs. /Week
Audit Points	1

Evaluation Scheme Based on syllabus of Sem. III & Sem. IV	
SEE	70
CIE (Project)	30
Total	100

Course Objectives

1. Introduce students to multi-disciplinary nature of Environment sciences and its importance
2. To create awareness about present Environmental problems and their root causes
3. Understand action needed for environment conservation for present and future
4. Introduction to sustainability and resource conservation

Course Outcomes

At the end of the course students will be able to

1. Explain various concepts in Environmental sciences
2. Describe collective responsibility towards conservatory approach
3. Explain importance of mass awareness and individual role in pollution prevention
4. Analyze social issues and local environmental problems and suggest solutions

	Course Contents	Hrs.
Unit 1.	<p>Biodiversity and its Conservation:</p> <p>Introduction - Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India. Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation. Western Ghat as a bio-diversity region.</p> <p>Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</p>	06
Unit 2.	<p>Environmental Pollution:</p> <p>Definition: Causes, effects and control measures of Air pollution. Water pollution. Soil pollution, Marine pollution.</p> <p>Noise pollution. Thermal pollution & Nuclear hazards.</p> <p>Solid Waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.</p>	10
Unit 3.	<p>Social Issues and the Environment:</p> <p>Disaster Management: Floods, earthquake, cyclone and landslides. Tsunami. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental Ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism</p>	10

and waste products. Environmental Protection and Projectwork
From Unsustainable to sustainable development. Environment Protection
Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and
Control of Pollution) Act. Wildlife Protection Act. Forest Conservation
Act. Population Growth.

Reference Books

1. Environmental Studies, Publisher Shivaji University Kolhapur
2. Environmental Studies, by Tiwari et al publisher IK International New Dehli
3. Environmental Studies by Dr. A Kaushik New Age International publisher New Dehli
4. Environmental Biology by KC Agarwal Nidi Pub. Ltd Bikaner
5. Ecology and Environment by PD Sharma Rastogi Publication Meerut
6. Environmental management, Wagner K.D., 1998, W.B. Saunders Co. Philadelphia, USA 499p.
7. Essentials of Ecology, Townsend C., Harper, J. and Michael Begon, Blackwell Science (TB)
8. Environmental Chemistry by SC Santra, *Published by* New Central Book Agency Kolkata