DKTE Society's

TEXTILE & ENGINEERING INSTITUTE

Rajwada, Ichalkaranji 416115

(An Autonomous Institute)

DEPARTMENT: TEXTILES

CURRICULUM

B. Tech. Man Made Textile Technology Program

Second Year

With Effect From

2021-2022

DKTE

Promoting Excellence in Teaching
Learning & Research

Second Year B. Tech Man Made Textile Technology
Semester- III

Sr. No.	Course Code	Name of the Course	Group	Teaching Scheme				Credits
				Theory Hrs/ Week	Tutorial Hrs/ Week	Practical Hrs/ Week	Total	
1	TML231	Textile Mathematics - III	BSC	3	-	-	3	3
2	TML232	Thermal Engineering	ESC	3	-	-	3	3
3	TML233	Polymer Science	ESC	3	-	-	3	3
4	TML234	Manmade Fibre Manufacturing - I	PCC	3	-	-	3	3
5	TML235	Manmade Staple Yarn Manufacturing -II	PCC	3	-	-	3	3
6	TML236	Manmade Fabric Forming Technology -II	PCC	3	-	-	3	3
7	TMP237	Manmade Fibre Manufacturing – I Lab	PCC	-	-	2	2	1
8	TMP238	Manmade Staple Yarn Manufacturing -II Lab	PCC	-	-	2	2	1
9	TMP239	Manmade Fabric Forming Technology -II Lab	PCC	-	-	2	2	1
10	TMP240	Textile Design and Colour	PCC	-	2	-	2	2
11	ADL201-A	Environmental Studies	MC	2	-	-	2	--
		Total		**20**	**2**	**06**	**28**	**23**

Group Details

HSMC: Humanities, Social Science & Management Courses
BSC: Basic Science Courses
ESC: Engineering Science Courses
PCC: Professional Core Courses
PEC: Professional Electives Courses
OEC: Open Elective Courses
PST: Project / Seminar / Ind. Training
MC: Mandatory Courses

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TML231: TEXTILE MATHEMATIC-III

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs./ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To explain ordinary differential equation and solve problems.
  To apply ordinary differential equations for solving simple mechanical and electrical problems.
- To explain linear differential equation and solve problems.
  To apply linear differential equations for solving simple mechanical and electrical problems.
- 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.
- 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

- Solve problems related to ordinary differential equations and its applications
- Solve linear differential equations and its applications.
- 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.
- Apply estimation for unknown parameters. Evaluate and interpret process and lot control methods.

Course Contents

Unit I	**Differential equations of first order & first degree**	**07 Hours**

a. Definition of exact differential equation, method of solution and examples
b. Definition of non-exact differential equation, method of solution and examples
c. Definition of linear differential equation, method of solution and examples
d. Definition of non-linear differential equation, method of solution and examples

Unit II	**Linear differential equations of nth order with constant coefficients**	**07 Hours**

a. Definition of LD equations, methods of finding Solution in the form y = C.F. + P.I and examples
b. Cauchy's homogeneous linear differential equations with constant coefficients and their solution.

Unit III	**Applications of ordinary and linear differential equations**	**06 Hours**

a. Applications of ordinary differential equations to solve simple electrical and mechanical engineering problems
b. Applications of LD equations to solve simple electrical and mechanical engineering problems

Unit IV	**Testing of hypothesis and large sample tests**	**07 Hours**

a. Introduction to testing of hypothesis,
b. Basic Concepts viz. Hypothesis, Statistic, Critical Region, Errors in testing, Level of Significance.
c. Large sample tests for population mean, equality of population means and examples
d. Large sample tests for population proportion, equality of population proportions and examples

Unit V	Small sample tests and estimation	07 Hours

a. Small sample tests for population mean, equality of population means and examples
b. Test for variance and equality of variances and examples
c. Test for goodness of fit and examples
d. Test for independence of attributes and examples

Unit VI	Statistical quality Control	05 Hours

a. Introduction to statistical quality control with types process control and lot control.
b. Control charts, $\bar{X}, R, np, p$ and C control charts and examples
c. Single and double sampling plans. Concepts of lot control AQL, LTPD, AOQ, AOQL, O.C. Curve

References Books:

1. A Text Book of Applied Mathematics: by J.N. & P.N. Wartikar.
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.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester III)
TML232: THERMAL ENGINEERING

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs/Week	03	SE-I: 25Marks SE-II: 25Marks SEE: 50Marks

Course Objectives:

- To understand basics of Thermodynamics, Thermodynamics processes and Air standard cycles. To get familiar with the procedure for solving numerical based on the same.
- 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.
- To understand basics of Refrigeration, Air Conditioning and Thermic fluid heating system, concerned parameters, psychometric processes, application of the same in textile industry.
- 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

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

Course Contents

Unit I	**Introduction to Thermodynamics and Air standard cycle.**	**09 Hours**

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.

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 diagram and numericals based on the same.

Unit II	**Properties of Steam**	**06 Hours**

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.

Unit III	Steam boilers, mountings & accessories:	07 Hours

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.

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 IV	Thermic Fluid Heating System:	02 Hours

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

Unit V	Refrigeration and Air Conditioning.	12 Hours

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.

Unit VI	Pumps, Compressors and Introduction to Pneumatics.	03 Hours

a. Pumps & Compressors: Pumps – reciprocating, centrifugal (construction and working principle). Compressors - classification, reciprocating, rotary - vane & screw compressor, centrifugal compressor, axial flow compressor.

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.

References 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.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester– III)
TML233: POLYMER SCIENCE

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs / Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To describe the basic determinants of fibre forming polymers.
- To discuss condensation, addition and co-polymerization.
- To discuss the techniques of polymerization.
- 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

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

Course Contents

Unit I	Basic Determinants of Fibre Forming Polymers	06 Hours

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

Unit II	Condensation Polymerization	06 Hours

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

Unit III	Addition polymerization	06 Hours

a. Mechanism, types, features and essential requirements of addition polymerization.
b. Types of initation, chemistry of initiators, retarders and inhibitors.
c. Effect of catalyst, temperature, pressure, solvents, modifiers, emulsifying and suspending agents on addition polymerisation.
d. Kinetics of addition polymerisation.
e. Industrial applications of addition polymerisation.

Unit IV	Co-polymerization	06 Hours

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

Unit V	Techniques of polymerization	04 Hours

a. Bulk polymerization: mechanism, salient features and applications
b. Solution polymerization: mechanism, salient features and applications
c. Suspension polymerization: mechanism, salient features and applications
d. Emulsion polymerization: Mechanism, salient features and applications
e. Solid-state polymerization and plasma polymerization: Concept, salient features and applications

Unit VI	Molecular Weight and Polymer Degradation	11 Hours

a. Concept of M_n, M_w and poly-dispersibility-index, their significance.
b. Effects molecular weight distribution of polymer on spinnability & drawability.
c. Light scattering and ultra-centrifuge techniques to determine M_w.
d. End-group analysis, osmotic pressure, cryscopy and viscosity methods to determine M_n and M_w.
e. Characteristics of polymer using DSC, TGA and DTA.
f. Characteristics of polymer using DMA and GPC
g. Concept of chain end and random polymer degradation.
h. Polymer degradation: thermal, mechanical, chemical and other agencies

References Books:

1. Polymer sciences and technology by Joel R. Fried.
2. Text book of polymer science by Fred W. Billmeyer, Jr.
3. Polymers and their properties by J.W.S. Hearle.
4. Organic chemistry of high polymers by Lenz.
5. Applied Polymer science by Flory.
6. Fundamentals of polymers by Anilkumar and Rakesh K. Gupta.
7. Principles of Polymerisation by George Odian.
8. Polymer science by Steven.
9. Introduction to polymer chemistry by G.S. Mishra.
10. Polymer science and technology of plastics & rubbers by Dr. Premamoy Ghosh.
11. Polymer Science by V.R. Gowarikar, N.V. Viswanathan & Jaydev Shreedhar.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester –III)
TML234: MAN MADE FIBRE MANUFACTURING - I

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs./ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To explain structural principles of fibre forming polymers
- To explain fundamentals of fibre spg processes
- To explain the process variables and devices of melt and solution spinning processes.
- To describe the function, composition, requirements and application of spin finish

Course Outcomes:

At the end of the course, students will be able to

- Explain structural principles of fibre forming polymers
- Describe fibre spg processes
- Explain the influence of process variables on characteristics of fibres.
- Explain the importance of spin finish application in fibre forming process

Course Contents

Unit I	**Structural Principles of Textile Fibres**	**06 Hours**

a. Concept of monomer, polymer
b. Requirements of polymer to form fibre
c. Molecular orientation and crystallinity in fibres
d. Molecular size & its interaction

Unit II	**Physical Fundamentals of the Fibre Spinning Process**	**06 Hours**

a. Fibre forming processes
b. Principles of solidification in spinning process
c. Rheology of spinning: shear flow and elongational flow
d. Flow instabilities, spinnability of liquids

Unit III	**Principles of Melt Spinning Process**	**06 Hours**

a. General features of the melt spinning process for filament yarn and staple fibres production
b. Direct melt spinning, spin draw process
c. Melt spinning variables: Primary and secondary variables
d. Non-steady state spinning conditions and non-uniform fibers.
e. Profile of polymer jet and velocity distribution in spinning process.

Unit IV	**Melt Spinning Devices**	**06 Hours**

a. Extruders
b. Manifold
c. Spinning pumps
d. Spin pack
e. cooling devices
f. T-up winders

Unit V	Principles of Solution Spinning Process	06 Hours

a. Preparation of spinning solution
b. Wet spinning process, Dry jet wet spinning process
c. Variables of wet spinning process
d. Dry spinning process
e. Theory of filament formation- solvent evaporation

Unit VI	Spin finish	06 Hours

a. Functions of spin finish
b. Composition of spin finish,
c. Requirements of good spin finish,
d. Rate of application of spin finish
e. Methods of applications of spin finish

References Books:

1. V. B. Gupta, V. K. Kothari, Manufactured Fibre Technology, Chapman and Hall, London.1997. ISBN: 9789401064736.

2. Fundamentals of fibre formation : the science of fibre spinning and drawing / Andrzej Ziabicki

3. High Speed Fiber Spinning, Science and Engineering Aspects. A. Ziabicki and H. Kawai, Editors. John Wiley & Sons, New York. 1985.

4. Man Made fibre science and technology - Marks and Allas. Wiley interscience New York, 1968.

5. V. R. Gowariker, Polymer Science, New Age International Publishers; Third edition, ISBN: 9387788644, (1 January 2019).

6. S.P. Mishra, A Textbook of Fibre Science and Technology, New Age International (P.) Limited, ISBN: 9788122412505 (2000).

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TML235: MANMADE STAPLE YARN MANUFACTURING -II

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs/ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To explain working principles and process parameters of Blow Room, Carding and Draw Frame.
- To describe constructional details and design aspects of machine parts and mechanisms involved in Blow Room, Carding and Draw Frame
- To Explanation to enumerate parameters influencing Blow Room, Carding and Draw Frame
- To Describe utilities, maintenance needs, methods to evaluate the processes. To acquaint the students with features of modern machines and industrial working by organizing industrial visits

Course Outcomes:

At the end of the course, students will be able to

- Explain the working principles and process parameters of Blow Room, Carding and Draw Frame
- Demonstrate the constructional details and design aspects of machine parts and mechanisms involved in Blow Room, Carding and Draw Frame
- Estimate parameters related to Blow Room, Carding and Draw Frame
- Explain maintenance needs, methods to evaluate the processes. Describe features of modern Blow Room, Carding and Draw Frame

Course Contents

Unit I	**Blow Room Process and Its Constructional Details**	**08 Hours**

a. Object of blow room machines, evolution of opening and cleaning principles.
b. Various components of blow room machines,
c. Different zones in blow room,
d. Conventional blow room machines.

Unit II	**Assessment of Blow Room Performance and Modern Development**	**09 Hours**

a. **Modern blow room machines** Automatic bale opener Mild openers– Maxi-flow / Uni-clean / Vario-clean Blenders Intensive openers.
b. Method used for - material transport in modern blow room- Waste removal- Dust removal- Contamination removal, Metal and fire/ smoke/spark detector. Waste recycling machines and methods.
c. **Assessment of performance of Blow Room** – Cleaning efficiency, Nep efficiency, fibre breakage, Openness value

Unit III	**Carding Process and Its Constructional Details**	**07 Hours**

a. **Feed to Card –** Principle and concept of chute feed to card. Advantages and limitations. Study of design details of different types of chute feeding systems.
b. **Constructional Details -**Revolving Flat Card, Detailed study of design developments in Taker in zone, Cylinder Flat Carding Zone, Doffer Zone, Sliver formation, Study of cards used in the industry
c. **Driving arrangement, production calculations, draft calculations, stop motions**.

Unit IV	Assessment of Card Performance and Modern Development	05Hours

a. **Transfer efficiency of card –** importance, concept, methods of finding transfer efficiency.
b. **Auto-levelers at Card –** Basic principles, concepts – Types– Working Principles–Setting of auto levelers.
c. **Card Clothing-** evolution and Metallic wire details, Card wire grinding and mounting.
d. **Assessment of performance of card** – Cleaning efficiency, Nep removal efficiency, fibre breakage
e. **Automation in Card**

Unit V	Draw Frame Process and Its Constructional Details	07 Hours

a. **Functions of draw-frame, principles of drafting and doubling.** Principles of roller drafting, design details, evolution and developments of drafting systems in draw-frame
b. Study of constructional details and design.
c. **Auto-levelers at Draw frame-** Basic principles, concepts – Types
d. **Production Calculations.**

Unit VI	Assessment of Draw Frame Performance and Modern Development	03 Hours

a. **Study of maintenance aspects**. Preventive maintenance schedule and life of parts.
b. **Assessment of performance of draw-frame**. Production and Quality (A% calculation, C.V% etc.)
c. **Defective production** -Causes and remedies for the same. Norms
d. **Automation in Draw Frame-** Study of modern draw-frames. Blending draw-frame.

References Books:

1. The Textile Institute Publication –Manual of Textile Technology-Short Staple Spinning Series Vol I to IV by W. Klein.
2. The Textile Institute publication, Manual of cotton Spinning series Vol - III.
3. Technology of cotton spinning by J. Janakiram.
4. Drawing, Combing and speed frame by Zoltan, S. Czaloky, The Institute of Textile Technology, Verginia
5. Draw frame, combing and speed frame by J.H. Black; The Textile Institute publication, Manual of cotton spinning Vol-IV part II.
6. Spun Yarn Technology by Eric Oxtoby.
7. Fundamentals of Spun Yarn Technology, By Carl Lawrence.
8. Blow room and carding –Training program conducted by NCUTE, IIT Delhi.
9. Carding by F. Charanlay

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TML236: MAN MADE FABRIC FORMING TECHNOLOGY - II

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs/ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To explain the construction and working of winding machine.
- To explain the construction and working of warping and sizing machine.
- To explain the design features of automatic loom.
- To explain the construction of bed ford cords, welts and pique.

Course Outcomes:

At the end of the course, students will be able to

- Explain the construction and working of winding machine
- Explain the construction and working of warping and sizing machine
- Understand the design features of automatic loom
- Understand the construction of bed ford cords, welts and pique.

Course Contents

Unit I	Winding	12 Hours

a. **Need and objects of winding process**
b. **Construction and working of winding machines.**
c. **Types of winding machines**
d. **Concept of P and Q winding, their applications.**
e. **Yarn Clearing**
f. **Knotting & Splicing**
g. Geometrical aspects: - Cone angle, angle of wind, wind per double traverse, surface speed, traverse speed, winding speed,
h. **Package Quality: Causes and remedies for various winding package defects**
i. Construction and working of pirn winding machine.
j. Calculations: winding speed, production per machine, and efficiency.

Unit II	Warping	08 Hours

a. **Need and objects of warping, classification of warping process**
b. **Construction and working of beam warping and sectional warping machine**
c. **Types of creels – ordinary and modern warping creels, tensioning arrangement etc.**
d. Stop Motion, Brake, Comb, Beam pressing, etc.
e. Concept of creel master, Management Information System
f. Calculations related with the production, efficiency, organizing the set, number of sections, etc.

Unit III	Sizing	08 Hours

a. Need and objects of sizing, Techniques of sizing – Hank, Ball warp & slasher sizing
b. Construction and working of sizing machine
c. Types of sizing creel – Over & under creel, vertical creel, inclined creel, equi-tensional creel and magazine creel
d. Size ingredients and size cooking
e. Modifications in creel design, Modern size box

f. Thermal performance of drying cylinders and steam traps
g. Control of size level, size pick-up, temperature, moisture, stretch, etc.
h. Factors affecting size pick up & size add-on
i. Concept of migration in sizing, Factors affecting migratory behavior of ends during sizing
j. Assessment of sizing performance
k. Concept of single end sizing & various methods
l. Concept of dyeing cum sizing, Management Information System
m. Calculations related to production, efficiency, size concentration, size pick up, stretch, drying, warp count, etc.

Unit IV	Automatic Weaving	04 Hours

a. Design features of automatic looms
b. Basic concept of - Weft feelers, Transfer mechanism, Automatic let-off motion, Warp stop motion, Centre weft fork
c. Operator assisting motions.

Unit V	Bed ford Cords	04 Hours

Bed ford Cords

Unit VI	Welts and Pique	03 Hours

Welts and Pique

References Books:

1. Fundamentals of Yarn Winding by Milind Koranne
2. Winding and Warping by M. K. Talukdar
3. Sizing by Ajgaonkar
4. The Technology of Warp Sizing by J.B. Smith
5. Modern Preparation & Weaving by A. Ormerod
6. Textile Maths Vol.lll by J.E. Booth
7. Principle of Weaving by Marks A.T.C. and Robinson
8. Weaving Machines, Materials and Methods by Prof. M.K. Talukdar, Prof.D.B. Ajgaonkar
9. Textile Design and Colour by Watson

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TMP237: Manmade Fibre Manufacturing – I Lab

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks

List of Experiments

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

Submission:

1. Duly completed journal

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TMP238: MANMADE STAPLE YARN MANUFACTURING -II LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks SEE:50 Marks

List of Experiments

1	Study of Bale Opening machine - Dimensions, Driving arrangement, speed calculation.
2	Study of Mild Opening machine - Dimensions, Driving arrangement, speed calculations and Opening Intensity Calculation.
3	Study of Fine cleaning machine – Dimension, driving arrangement used, Speed calculations and Opening Intensity Calculation.
4	Study of De-dusting machines – Working, Dimension, Driving arrangement and calculations.
5	Study of feeding (chute feed) to card machine – Dimension, driving arrangement used, Speed calculations.
6	Study of Passage, Driving arrangement and calculations of carding machine
7	Carding Setting- Front Zone
8	Carding Setting- Back Zone
9	Study of constructional details, Driving arrangement and calculation of Draw Frame.
10	Study of auto-levelers used on card and Draw frame.
11	Demonstration of wire mounting, grinding, roller mounting and buffing machine.
12	Mill visit I to study modern features of Blow Room, Carding and Draw Frame

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TMP239: MAN MADE FABRIC FORMING TECHNOLOGY- II LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks SEE: 50 Marks

List of Experiments

1	Study of modern winding machine
2	Study of the effect of splicing parameters on the splice quality.
3	Study of sectional warping machine & machine drive.
4	Study, dismantling and resetting of side lever under pick mechanism.
5	Dismantling and resetting of clutch drive.
6	Dismantling and resetting of side sweep weft feeler mechanism
7	Dismantling and resetting of pirn change mechanism
8	Dismantling and resetting of semi positive let-off mechanism.
9	Fabric analysis – Bed ford cord fabric
10	Fabric analysis – Backed Cloth
11	Visit to winding unit
12	Visit to warping & sizing unit

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TMP240: TEXTILE DESIGN AND COLOUR LAB

Lab Scheme: Tutorial: 02 Hrs/ Week	Credits 02	Evaluation Scheme: CIE: 50 Marks

List of Assignments

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, Dominance (Any one of list.)
7	Composition of textile design by - Rectangle base, Drop base – half drop or full drop.
8	Composition of textile design by Diamond base, Ogee base, Sateen base. (Any one of list)
9	Development of point paper design for dobby weaving.

Submission – Completed Assignments

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
ADL201-A: ENVIRONMENTAL STUDIES

Teaching Scheme:		Evaluation Scheme:
Lectures: 02 Hrs/ Week		SEE-: 70 Marks
		CIE (Project work) -: 30 Marks
		(Annual Evaluation in Sem. IV)

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

Course Objectives:

- To recall fundamental physical and biological principles those govern natural processes.
- To state the importance of ecological balance for sustainable development.
- To describe the impacts of developmental activities and mitigation measures and to further understand the environmental policies and regulations.
- To identify the complex relationships between scientific approaches to environmental issues and political, social, economic, and ethical perspectives on the environment.

Course Outcomes:

At the end of the course, students will be able to

- Develop an understanding of different natural resources including renewable resources.
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Aware of important acts and laws in respect of environment.
- Demonstrate critical thinking skills in relation to environmental affairs

Course Contents

Unit I	Significance of environmental studies	09 Hours

a. Multidisciplinary nature of environmental studies Need for public awareness.
b. Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
c. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
d. Mineral resources: Usage and exploitation, environmental effects of extracting and using mineral resources.
e. Food resources: World food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems.
f. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
g. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
h. Role of an individual in conservation of natural resources.
i. Equitable use of resources for sustainable lifestyle.

Unit II	Ecosystems	09 Hours

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: - a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit III	Biodiversity and its Conservation	08 Hours

Introduction – Definition: genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.; Biodiversity at global, National and local levels.; India as a mega-diversity nation; Western Ghats as a bio-diversity region; 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.

References Books:

1. Clark R. S., Marine Pollution, Clanderson Press Oxford (TB) Pg No. 6.
2. Cunningham, W. P. Cooper, T. H. Gorhani, E. & Hepworth, M. T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
3. De A. K., Environmental Chemistry, Wiley Eastern Ltd.
4. Down to Earth, Centre for Science and Environment ®
5. Gleick, H., 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & security. Stockholm Env. Institute. Oxford Univ. Press 473p.
6. Hawkins R. e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay

Second Year B. Tech Man Made Textile Technology
Semester- IV

Sr. No.	Course Code	Name of the Course	Group	Teaching Scheme				Credits
				Theory Hrs/ Week	Tutorial Hrs/ Week	Practical Hrs/ Week	Total	
1	TML251	Textile Mathematics - IV	BSC	3	-	-	3	3
2	TML252	Textile Electronics	ESC	4	-	-	4	4
3	TML253	Chemical processing of Textiles-I	PCC	3	-	-	3	3
4	TML254	Manmade Fibre Manufacturing - II	PCC	3	-	-	3	3
5	TML255	Manmade Staple Yarn Manufacturing -III	PCC	3	-	-	3	3
6	TML256	Manmade Fabric Forming Technology -III	PCC	3	-	-	3	3
7	TMP257	Textile Electronics Lab	ESC	-	-	2	2	1
8	TMP258	Chemical processing of Textiles-I Lab	PCC	-	-	2	2	1
9	TMP259	Manmade Fibre Manufacturing - II	PCC	-	-	2	2	1
10	TMP260	Manmade Staple Yarn Manufacturing -III	PCC	-	-	2	2	1
11	TMP261	Manmade Fabric Forming Technology -III	PCC	-	-	2	2	1
12	ADL201	Environmental Studies	MC	-	2	-	2	--
		Total		**19**	**2**	**10**	**31**	**24**

Group Details

HSMC: Humanities, Social Science & Management Courses

BSC: Basic Science Courses

ESC: Engineering Science Courses

PCC: Professional Core Courses

PEC: Professional Electives Courses

OEC: Open Elective Courses

PST: Project / Seminar / Ind. Training

MC: Mandatory Courses

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester –IV)
TML251: TEXTILE MATHEMATICS-IV

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs./ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To explain Laplace transform & inverse of it with examples.
  To apply Laplace transform for solving L.D. equations
- To teach vector differentiation with examples.
  To define Fourier series and explain formulae and solve examples.
- To explain Analysis of Variance types one way, two way analysis of variance and examples.
- To explain DOE with its importance, basic principles, basic designs CRD, RBD, LSD and factorial experiments

Course Outcomes:

At the end of the course, students will be able to

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

Course Contents

Unit I	**Laplace Transforms and its application to L.D Equations**	**08 Hours**

a. Definition, Laplace transforms of standard functions, of derivatives and integrals with examples.
b. Inverse Laplace transforms by simplification, partial fraction and convolution method
c. Method of solving L.D. equations with initial conditions using Laplace transforms and examples.

Unit II	**Vector differentiation**	**05 Hours**

a. Definition of vector function of scalar t and its derivative with interpretation. Vector tangent, velocity and acceleration vectors with examples.
b. Definition of scalar, vector valued function of point $p(x, y, z)$. Definition of gradient, divergence, curl, directional derivative, solenoidal, irrotational vector fields with examples

Unit III	**Fourier Series**	**06 Hours**

a. Full range Fourier series, definition, Euler's formulae for constants with examples of $(0, 2\pi), (-\pi, \pi), (0, 2C), (-C, C)$.
b. Hal range Fourier series, definition, Euler's formulae for constants with examples of $(0, \pi), (0, C)$.

Unit IV	**Analysis of Multivariate Data**	**04 Hours**

a. Multivariate data, multiple correlation coefficients, partial correlation coefficients with examples.
b. Multiple regression, multiple regression equations with examples.

Unit V	**Analysis of Variance**	**08 Hours**

a. Introduction of Analysis of Variance, One-way analysis of variance with examples.
b. Two-way analysis of variance with one observation per cell and examples.
c. Two-way analysis of variance with m observations per cell and examples.

Unit VI	Design of experiments with basic designs and factorial experiments	08 Hours

a. Introduction of design of experiments, basic principles and basic designs.

b. Basic designs CRD, RBD, and LSD with examples.

c. Factorial experiments, 2^2 and 2^3 factorial experiments with examples.

References Books:

1. A Text Book of Applied Mathematics: by J.N. & P.N. Wartikar.
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.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TML252: TEXTILE ELECTRONICS

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 04 Hrs/ Week	04	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

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

Course Outcomes:

At the end of the course, students will be able to

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

Course Contents

Unit I	Basic Electronics and Semiconductor devices	19 Hours

Classification of materials- conductors, insulators and semiconductors;
Electronics components, passive components- resistors, capacitors and inductors;
Semiconductor diode, Rectifiers- half wave and full wave; Filters-shunt capacitor filter, series inductor filter; Zener diode, zener regulator; Transistor- Construction, working, configurations, common emitter characteristics, Basic CE amplifier

Unit II	Op-amp and power semiconductor devices	08 Hours

Op-amp- Introduction, block diagram, symbol, ideal op-amp, IC741-pinout and specifications;
Open loop op-amp configuration, drawbacks of open loop configuration;
Concept of feedback in amplifier, +ve and –ve feedback, closed loop op-amp configuration
Power semiconductor devices: SCR construction, operation, turning ON and OFF of SCR, SCR characteristics, SCR in DC Motor speed control; Triac- Construction, working and characteristics, diac- Construction, working and characteristics, AC power control using triac

Unit III	Transducers and electromechanical devices	08 Hours

Introduction, transducer classification – Primary and secondary transducers, active and passive transducers, analog and digital transducers, basic requirements of transducers;
Photodiode, phototransistor, LDR, LED, Optocouplers, Optical shaft encoders;
Pressure measurement –bourdon tubes; Temperature Transducers – RTD, Thermocouple, Thermistors;
Strain gauge- working principle, bonded type strain gauge; Linear variable differential transformers (LVDT), Capacitive transducers, Piezo electric transducers, Proximity sensors
Electromechanical devices- relay, solenoid valve

Unit IV	Digital Electronics	09 Hours
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, 4-bit register, memory & its types		
Unit V	**Microprocessor, Microcontroller and PLC**	**04 Hours**
8085 microprocessor features, pin diagram and architecture; 8051 microcontroller features, block diagram; PLC block diagram		
Unit VI	**Automation in Textiles**	**04 Hours**
Automatic textile control systems- feedback, feed forward and combined; applications of electronics in spinning, weaving, testing and finishing		

References Books:

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

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – III)
TML253: CHEMICAL PROCESSING OF TEXTILES- I

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs/ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To describe the objects of sizing and preparatory processes
- To describe the process sequence in pre-treatment of various types of textiles
- To explain the role of various chemicals used in pre-treatment of textiles with their objectives
- To explain the importance and evaluation methods of mercerization

Course Outcomes:

At the end of the course, students will be able to

- Illustrate the importance of sizing and pretreatments
- Describe process sequence in pre-treatment of various types of textiles
- Understand objectives various chemicals used in pre-treatment of textiles
- Illustrate the importance and evaluation of mercerization

Course Contents

Unit I	**Sizing**	**06 Hours**

a. **Sizing:** Process, Purpose, Ingredients: Types, functions
b. **Adhesives:** Classification, Starches- Properties, testing,
c. **Softeners:** Types, properties, testing methods, Size paste formulation: Cotton, P/C, P/V blended yarn.

Unit II	**Grey Fabric Inspection and Mechanical Preparatory Processes**	**06 Hours**

a. **Grey fabric inspection:** Purpose, Faults in grey fabric- four point & ten point system of inspection, Criteria for rejection.
b. **Mechanical Pretreatments:** Importance, application, types , Shearing & cropping machine: 2 cutter and 4 cutter
c. **Singeing:** Importance, Construction & working principle of gas singeing machines for woven and knitted fabric

Unit III	**Desizing**	**04 Hours**

a. **Size on grey fabric:** Identification
b. **Desizing process:** Purpose, Methods, Factors affecting process
c. **Desizing machines:** Batch wise & continuous
d. **Desizing efficiency:** Tegewa, weight loss percentage evaluation methods

Unit IV	**Scouring**	**08 Hours**

a. **Scouring:** Importance, Mechanism and Reactions
b. **Methods:** Alkaline scouring, solvent scouring, bio-scouring,
c. **Scouring process:** cotton, polyester (PET) and their blends, knit goods,
d. **Scouring machine:** Batch-wise, semi continuous & continuous,
e. **Wool Scouring, Crabbing, carbonization, and milling**,
f. **Degumming of silk:** Purpose, Methods - Soap, alkali, and enzyme,
g. **Evaluation of scouring:** by absorbency, copper number, weight loss and strength loss.

Unit V	Bleaching	08 Hours

a. **Sodium hypochlorite bleaching:** Purpose, mechanism, Procedure for cotton, factors affecting to hypochlorite bleaching.
b. **Hydrogen peroxide bleaching:** Purpose, mechanism, factors affecting, Role of stabilizer, activator, Process for cotton, Polyester and their blends
c. Comparison between H_2O_2 & NaOCl bleaching,
d. **Sodium chlorite bleaching:** Mechanism, Procedure for polyester.
Wool, silk, knits and colored woven goods: Precautions, procedure of bleaching.
e. **Machines:** Batch wise, semi continuous & continuous methods of bleaching.
f. **Efficiency of bleaching:** Whiteness index

Unit VI	Mercerization	07 Hours

a. Mercerization: Importance, changes occurred in fibre
b. Causticization: Purpose, process,
c. Factors affecting the mercerization process,
d. Machines: Yarn mercerization, pad-chain, padless-chainless, hot mercerization, liquid ammonia mercerization,
e. Efficiency: BAN, Axial ratio, De-convolution count and absorbency method

References Books:

1. Textile Sizing by Goswami, B. C.; Anandjiwala, R. D.; Hall, D., CRC Press, 2004, ISBN: 9780203913543
2. Sizing by Ajgaonkar, D.B., Talukdar, M. K., Wadekar, V. R., Textile Trade Press, Ahmedabad, 1st Edition, 1982
3. Warp Sizing by Paul V. Seydel.
4. Chemical Technology in the Pretreatment Processes of Textile by Karmakar, S. R., Elsevier Science Publication, Netherlands, 1999.
5. Textile Chemical Processing Vol- 1; Author: Jitendra Kumar; Publisher: Pankaj Publication International; ISBN : BK 0202435
6. Textile Scouring and Bleaching by Trotman, E.R., Hodder Arnold, 1968 ISBN: 9780852640678
7. Textile Scouring and Bleaching by Choudhary, A. K. R. Science Publishers, Enfield, NH, USA, 2006, ISBN: 9781578084043
8. Technology of Bleaching and Mercerizing by Shenai, V. A., Sevak Publication, Mumbai, 2003.
9. Introduction to Textile Bleaching by J. T. Marsh. Chemical Processing of Synthetic Fibres and Blends by Datye, K. V.; Vaidya, A. A., Wiley-Blackwell, New York, 1984, ISBN: 9780471876540
10. Chemical Processing of Polyester/ Cellulosic Blends by Mittal, R.M., Trivedi, S. S., ATIRA, Ahmedabad, 1983.
11. Chemical processing of textiles, NCUTE publication.
12. Technology of Textiles- Spinning & Weaving, Dyeing, Drying, Printing & Bleaching by EIRI Board, Engineers India Research Institute, ISBN:9788186732489.
13. The Complete Technology Book on Textile Processing With Effluents Treatment by NIIR Board, NIIR Board, 2004, ISBN: 8178330504
14. Mercerization by J.T. Marsh.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester –IV)
TML254: MANMADE FIBRE MANUFACTURING - II

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs./ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

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

Course Outcomes:

At the end of the course, students will be able to

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

Course Contents

Unit I	**Polyester Fibres**	**07 Hours**

a. Overview of the processes to produce Poly(ethylene terepthalate) staple/ filament yarns.
b. Poly (ethylene terepthalate) polymer and fibre /filament yarn production
c. Structure and properties of Poly(ethylene terepthalate) fibre
d. Developments in Poly(ethylene terephthalate) fibres
e. Applications of Poly(ethylene terepthalate) fibres
f. Poly(ethylene terepthalate) micro fibre, their production, properties and applications

Unit II	**Polyamide Fibres**	**07 Hours**

a. Nylon6, nylon6,6 polymer, fibres/filament yarn production
b. Structure and properties of nylon 6 and nylon 6, 6 fibres.
c. Applications of polyamide fibres.
d. Developments in polyamide fibres

Unit III	**Polypropylene Fibres**	**06 Hours**

a. Tacticity of polypropylene polymer
b. Production of polypropylene polymer
c. Production of polypropylene fibres/filament yarns
d. Problems in the polypropylene fibre production and possible causes
e. Structure and properties of polypropylene fibres, application areas
f. Developments in polypropylene fibres

Unit IV	**Acrylic Fibre (PAN)**	**06 Hours**

a. Concepts of acrylic and modacrylic fibres
b. Production of PAN polymer for acrylic and modacrylic fibres.

c. Production of PAN fibres
d. Structure and properties of PAN fibres
e. Application areas for PAN fibres
f. Developments in acrylic fibres

Unit V	Regenerated Fibres	07 Hours

Viscose Fibres:-

a. Production of viscose fibres – preparation of spinning solution, spinning of fibres,
b. HWM & LWM viscose fibres
c. Structure and properties of viscose fibres
d. Developments in viscose fibres
e. Applications of viscose fibres.

Tencel/Lyocell Fibres:-

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

Cuprammonium rayon:-

g. Production, properties and application of cuprammonium rayon

Unit VI	Elastomeric Fibres	05 Hours

a. Concept of elastomeric fibres and segments of elastomeric polymer
b. Extensibility and recovery mechanism
c. Elastomeric fibre production
d. Properties of elastomeric fibres and application areas.

References Books:

1. V. B. Gupta, V. K. Kothari, Manufactured Fibre Technology, Chapman and Hall, London.1997. ISBN: 9789401064736.
2. A.A. Vaidya, Production of Synthetic Fibres, Prentice Hall of India Pvt. Ltd., New Delhi, 1988. ISBN: 9780876925782
3. James Gordon Cook, Handbook of Textile Fibres, Vol.2 Manmade Fibres, Woodhead Publishing Series in Textiles, 1984. ISBN: 9781855734845
4. C. Woodings, Regenerated Cellulose Fibres, Woodhead Publishing Ltd., 2000. ISBN: 9781855734593
5. S. Eichhorn, J.W. S. Hearle, M. Jaffe, T. Kikutani, Handbook of Textile Fibre Structure, Volume 1: Fundamentals and Manufactured Polymer Fibres, CRC Press, Woodhead Publishing in Textiles, 2009. ISBN: 9781439801192
6. S.P. Mishra, A Textbook of Fibre Science and Technology, New Age International (P.) Limited, ISBN: 9788122412505 (2000).

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TML255: MAN MADE STAPLE YARN MANUFACTURING – III

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs/ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

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

Course Outcomes:

At the end of the course, students will be able to

- Explain the working principles and process parameters of combing preparatory, comber, speed frame ring frame and doubling.
- Demonstrate the constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber, speed frame, ring frame and doubling.
- Estimate parameters related to combing preparatory, comber, speed frame ring frame and doubling.
- Explain maintenance needs, methods to evaluate these processes.

Course Contents

Unit I	Comber Preparatory	05 Hours

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

Unit II	Combing Process and Constructional Details of Comber	08 Hours

a. **Objects of combing process. Study of combing cycle, Index Cycle.**
b. **Constructional details of Comber-** feeding, nipper assembly, cylinder and detaching rollers, cylinder needles, web and sliver transport, drafting and coiling at comber. Semi combing, normal combing, super combing and double combing.
c. **Forward and backward feed in combing. Maintenance of comber, Comber Settings.**

Unit III	Assessment of Comber Performance and Modern Development	05 Hours

a. **Assessment of Comber Performance –** Norms for production, speed. Combing efficiency, Fractionating efficiency of comber. Influence of combing operation on quality
b. **Automation in Comber:** Automatic and centralized noil collection. Automatic material handling. Stop motions in comber. Technical specifications of modern combers, available in the world market

Unit IV	Speed Frame	06 Hours

a. Objects of speed frame. Concepts of drafting, twisting and winding process.
b. Constructional aspects of Speed-frame – Creel, Top arm apron drafting system, Spindle & Flyer assembly, Bobbin building, stop motions.
c. Study of mechanisms like – differential motion, swing motion, building mechanism. Performance assessment of Speed-frame – norms,
d. Zero break concept, block creeling.
e. Maintenance of speed frame. Features of modern speed-frame machines.

Unit V	Ring Spinning Process and Constructional Details of Ring Frame	7 Hours

a. **Ring Spinning Process and Constructional Details of Ring Frame:** Objects and principle of operation, Creel, Drafting System, Top arm roller weighting, Spindle and driving arrangement, The thread guide devices, The balloon control ring and the separator and their functions, important design features and settings, Ring and Traveller, Study of building mechanism.
b. **Spinning Geometry:** Importance, effect of spinning angle, Drafting angle, spinning triangle. Introduction to spinning tension

Unit VI	Ring Frame Performance and Modern Developments and Doubling.	08 Hours

a. Developments in Ring Frame On line Monitoring of Ring frame Operation, Pneumafil and overhead cleaners, Auto-doffing, Basics of Compact Spinning
b. Routine maintenance schedule of ring frames Relative Humidification requirement and its importance. Performance assessment of ring frame.
c. Introduction to doubling, types, construction of ring doubler and Two for One twister, advantages and modern developments.

References Books:

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

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TML256: MANMADE FABRIC FORMING TECHNOLOGY- III

Teaching Scheme:	Credits	Evaluation Scheme:
Lectures: 03 Hrs/ Week	03	SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks

Course Objectives:

- To explain high speed shedding mechanism
- To explain need of modern weaving technology
- To explain weaving technologies like Projectile & Rapier
- To explain weaving technologies like Airjet & Waterjet

Course Outcomes:

At the end of the course, students will be able to

- Differentiate between various high speed shedding mechanism
- Explain need of modern weaving technology
- Explain projectile & rapier technology
- Explain airjet & watejet technology

Course Contents

Unit I — High Speed Shedding Mechanism — 08 Hours

a. Limitations of Tappet shedding motion, positive cam shedding concept and need, Positive cam shedding motion: constructional and working details.
b. Limitation of mechanical dobby, Rotary mechanical and electronically controlled dobby, various models available in the markets.
c. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard.

Unit II — Introduction to Modern Weaving Technology — 03 Hours

a. Classification of shuttles technology, Need for better weft insertion methods.
b. Requisites for successful installation of shuttleless weaving machines.

Unit III — Projectile Weaving Machine — 08 Hours

a. History of Projectile weaving machine; Machine drive & passage,
b. Picking phases, Projectile acceleration & retardation, torsion rod details,
c. Projectile preparation for picking, selvedge motion, Receiving unit,
d. Let-off motion (Mechanical & power), Take-up motion,
e. Specifications of projectiles & grippers for various applications,
f. All auxiliary motions such as brake, clutch, oiling, cleaning, MIS, pick finding, Multi colour weft insertion, weft stop, warp stop, whip roller, weft brake etc.

Unit IV — Rapier Weft Insertion — 08 Hours

a. Study of weft velocity curves for looms with different methods of weft insertion,
b. Concept of Dewas & Gabler rapier systems, their comparison with other weft insertion systems from weft acceleration & retardation point. Study of effect of reed width on loom speed,
c. Principles of different single & double rapier weft insertion systems (Drive), their comparison.
d. Study of rapier heads,
e. Rapier machine models,
f. Let-off & take up motion (Mechanical & power), All auxiliary motions.

Unit V	Air Jet Weft Insertion	08 Hours

a. Machines for air jet weaving, Introduction, overview of weft insertion elements,
b. loom timing of picking elements and settings,
c. Constructional details of profile reed,
d. Air supply and energy consumption, Air flow in nozzles and guide channel,
e. Performance of yarns in air jet insertion, Optimization of settings,
f. Weft stops and breaks, application of air jet weaving. Drive, Pneumatic circuit for air supply,
g. Technical features of modern air jet weaving machines,
h. Quality of Air.

Unit VI	Water Jet Weft Insertion	04 Hours

a. Introduction, Design requirements,
b. Picking mechanism, weft insertion elements, loom timing and settings,
c. Features of water jet looms,
d. Applications of water jet weft insertion system,
e. Comparison with air jet, maintenance,
f. Technical features of modern water jet weaving machines.

References Books:

1. Handbook of weaving – Sabit Adanur. ISBN-10: 9781587160134
2. Modern preparation and weaving machinery – A Ormerod ISBN-10 : 1855739984
3. Shuttleless Looms – J. J. Vincent. ISBN-10 : 090073941X
4. Shuttless weaving machine – O. Talavasele, V. Svaty. ISBN-10 : 044499758X
5. AIR-JET WEFT INSERTION-L. Vangheluwe. Textile Progress: Vol 29, No 4

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TMP257: TEXTILE ELECTRONICS LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks See: 50 Marks

List of Experiments

1	VI characteristics of semiconductor diode.
2	Half wave rectifier- without filter and with filter.
3	Full wave rectifier- without filter and with filter.
4	Reverse characteristics of zener diode.
5	Closed loop inverting amplifier using Op-amp 741.
6	Closed loop non-inverting amplifier using Op-amp 741.
7	AC power control using triac.
8	LDR characteristics.
9	Displacement measurement using LVDT.
10	Speed measurement using magnetic and photo-electric pickup.
11	Realization of digital gates.
12	Realization of flip-flops/ decoder.

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TMP258: CHEMICAL PROCESSING OF TEXTILES- I LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks

List of Experiments

1	To find moisture content, ash content and total dissolved solids in the given starch sample.
2	To remove size on the given textile by using suitable desizing method.
3	Use open bath scouring method to improve the absorbency of the given cotton fabric
4	Use pressure boil scouring method to improve the absorbency of the given cotton fabric.
5	Bio scouring of Cotton knitted fabrics.
6	Use relevant degumming method to remove Serecin from the given silk.
7	Use suitable bleaching method to improve whiteness of the given cotton fabric.
8	Use combined scouring and bleaching method to improve absorbency and whiteness of the given cotton fabric
9	Use open bath scouring and bleaching method for the given wool fabric
10	Use open bath bleaching method for the given silk fabric
11	Use hank mercerization method for the given cotton hank
12	Determine Barium Activity Number (BAN) of the given mercerized goods
13	Visit to sizing unit and process house

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TMP259: MANMADE FIBRE MANUFACTURING – II

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks SEE : 50 Marks

List of Experiments

1	Demonstration of high speed draw winder and production of FDY.
2	Demonstration of CRAPE TFO machine
3	Determination of the density of fibre by using Density Gradient Column.
4	Determination of the spin finish of the fibre by cold extraction method.
5	Determination of the draw force, crimp force of POY and Textured yarns using Dynafil Tester.
6	Effect of heat-setting temperature on the dimensional stability of filament yarns
7	Effect of heat setting time on the dimensional stability of filament yarns
8	Effect of heat setting tension on the dimensional stability of filament yarns
9	Comparison of boiling water shrinkage and hot air shrinkage of filament yarns.
10	Effect of twist on filament yarn characteristics
11	Comparison of properties of single and multi-stage drawn filament yarns characteristics
12	Industrial visit

Submission:

1. Duly completed journal

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TMP260: MAN MADE STAPLE YARN MANUFACTURING - III LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks

List of Experiments

1	Study of Passage, Driving arrangement & calculations of Sliver lap Lap machine.
2	Study of Passage, Driving arrangement & calculations of Ribbon Lap machine
3	Study of working principle, roller setting and lap forming mechanism on in Comber Preparatory.
4	Study of constructional aspects, combing cycle & index chart of modern comber.
5	Study of Comber setting
6	Study of Passage, Driving arrangement and calculation of Speed Frame.
7	Study of coils per inch of speed frame & differential gearing.
8	Study of building mechanism of speed frame.
9	Driving arrangement & calculations related to production, constants, draft twist etc. of Ring frame.
10	Study settings and building mechanism of ring frame and spinning geometry.
11	Study of Passage and calculations of Ring doubler and Two For One twister
12	Mill visit I to study modern features of combing preparatory, comber, speed frame and ring frame.

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
TMP261: MANMADE FABRIC FORMING TECHNOLOGY-III LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks

List of Experiments

1	Study and setting of Positive Cam Shedding.
2	Study of Rotary Dobby.
3	Study of electronic Jacquard.
4	General study of projectile machine and drive arrangements for various motions.
5	Study of Sulzer picking motion.
6	Study of Smit flexible rapier weaving machine and style change Process..
7	Study of Dornier rigid rapier weaving machine and its control panel.
8	Study of SMIT Air Jet weaving machine , control panel and style change process.
9	Study of Dobby CAD software
10	CAD software application – Creation of weaves
11	Design preparation on CAD software for Electronic Jacquard
12	Visit to airjet weaving unit.
13	Visit to rapier weaving unit.

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Man Made Textile Technology (Semester – IV)
ADL201: ENVIRONMENTAL STUDIES

Teaching Scheme:		Evaluation Scheme:
Tutorial: 02 Hrs / Week		SEE-: 70 Marks CIE (Project work) -: 30 Marks (Based on syllabus of Sem. III and Sem. IV)

Course Objectives:

- To recall fundamental physical and biological principles those govern natural processes.
- To state the importance of ecological balance for sustainable development.
- To describe the impacts of developmental activities and mitigation measures and to further understand the environmental policies and regulations.
- To identify the complex relationships between scientific approaches to environmental issues and political, social, economic, and ethical perspectives on the environment.

Course Outcomes:

At the end of the course, students will be able to

- Develop an understanding of different natural resources including renewable resources.
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Aware of important acts and laws in respect of environment.
- Demonstrate critical thinking skills in relation to environmental affairs

Course Contents

Unit IV	Environmental Pollution	08 Hours

Definition: Causes, effects and control measures of: a) Air pollution, b) Water pollution, c) Soil pollution, d) Marine pollution, e) Noise pollution, f) Thermal pollution, g) Nuclear hazards

• Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
• Role of an individual in prevention of pollution.
• Pollution case studies
• Disaster management: Floods, earthquake, cyclone and landslides. Tsunami.

Unit V	Social Issues and the Environment	09 Hours

From Unsustainable to Sustainable development; 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; Climate change, Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; Wasteland reclamation; Consumerism and waste products.

Unit VI	Environmental Protection	10 Hours

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 and Human Health, Human Rights. ; Field Work--Visit to a local area to document environmental assets river/forest/grassland/hill/mountain or Visit to a local polluted site–urban/rural/Industrial/Agricultural or Study of common plants, insects, birds or Study of simple ecosystems-ponds, river, hill slopes, etc.

References Books:

1. Clark R. S., Marine Pollution, Clanderson Press Oxford (TB) Pg No. 6.
2. Cunningham, W. P. Cooper, T. H. Gorhani, E. & Hepworth, M. T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.

3. De A. K., Environmental Chemistry, Wiley Eastern Ltd.
4. Down to Earth, Centre for Science and Environment ®
5. Gleick, H., 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & security. Stockholm Env. Institute. Oxford Univ. Press 473p.
6. Hawkins R. e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay