DKTE Society's
TEXTILE & ENGINEERING INSTITUTE

Rajwada, Ichalkaranji 416115

(An Autonomous Institute)

DEPARTMENT: TEXTILES

CURRICULUM
B. Tech. Textile Plant Engineering Program

Second Year

With Effect From

2021-2022

Second Year B. Tech Textile Plant Engineering
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	TPL231	Textile Mathematics - III	BSC	3	-	-	3	3
2	TPL232	Thermal Engineering	ESC	3	-	-	3	3
3	TPL233	Metallurgy and Material Science	ESC	3	-	-	3	3
4	TPL234	Manufacturing Processes - II	ESC	3	-	-	3	3
5	TPL235	Yarn Manufacturing Machinery - II	PCC	3	-	-	3	3
6	TPL236	Fabric Manufacturing Machinery - II	PCC	3	-	-	3	3
7	TPP237	Manufacturing Processes - II Lab	ESC	-	-	2	2	1
8	TPP238	Yarn Manufacturing Machinery - II Lab	PCC	-	-	2	2	1
9	TPP239	Fabric Manufacturing Machinery - II Lab	PCC	-	-	2	2	1
10	TPP240	Textile Machine Drawing Lab	ESC	-	-	2	2	2
11	ADL201-A	Environmental Studies	MC	2	-	-	2	--
		Total		**20**	**-**	**08**	**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. Textile Plant Engineering (Semester – III)
TPL231: TEXTILE MATHEMATIC-III

Teaching Scheme: Lectures: 03 Hrs./ Week	Credits 03	Evaluation Scheme: 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. Textile Plant Engineering (Semester – III)** **TPL232: THERMAL ENGINEERING**		
Teaching Scheme: Lectures: 03 Hrs/Week	Credits 03	Evaluation Scheme: 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. Textile Plant Engineering (Semester – III)
TPL233: METALLURGY AND MATERIAL SCIENCE

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

Course Objectives:

- ☐ To acquaint students with the basic concepts of Metal Structure
- ☐ To impart fundamental knowledge of Ferrous and Non Ferrous Metal Processing
- ☐ To study applications of different Metals and Alloys
- ☐ To Know Fundamentals of Metallography and To develop futuristic insight into Metals

Course Outcomes:

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

- ☐ Understand basic concept of metal structure
- ☐ Apply fundamental knowledge of Ferrous and Non Ferrous Metal
- ☐ Selection of Metals and Alloys for different application
- ☐ Analyze various heat treatment processes

Course Contents		
Unit I	**Phase Diagrams and Iron-Carbon Diagram**	**07 Hours**

a. Solid solutions: Introduction, Types, Hume rothery rule for substitutional solid solutions
b. Solidification: Nucleation & crystal growth, solidification of pure metals, solidification of alloys.
c. Phase Diagrams: Cooling curves, types of phase diagrams, Gibbs phase rules
d. Iron-Carbon Diagram: Iron-carbon equilibrium diagrams in detail with emphasis in the invariant reactions

Unit II	**Ferrous materials**	**07 Hours**

a. Carbon Steel: Classification, types & their composition, properties and Industrial application.
b. Alloy Steels: Classification of alloy steels & Effect of alloying elements, examples of alloy steels, (Stainless steel, Tool steel) sensitization of stainless steel.
c. Designation of carbon steel and alloy steels as per IS, AISI, SAE Standards.
d. Cast Iron: Classification, types & their composition, properties and Industrial application of (White CI, Gray CI, SG CI, Malleable Cast and alloy Cast Iron).

Unit III	**Heat treatments**	**08 Hours**

a. Austenite transformation in steel: Time temperature transformation diagrams, continuous cooling transformation diagrams. Retained austenite and its effect Steps in Heat treatment and Cooling Medium.
b. Heat Treatment Processes: Introduction, Annealing (Full annealing, Process annealing, Spherioidise annealing, isothermal annealing, stress relief annealing), Normalising, Hardening, Tempering, Austempering, Martempering, Sub-Zero Treatment, Hardenability.
c. Surface Hardening: Classification, Flame hardening, Induction hardening, Carburising, Nitriding, Carbonitriding

Unit IV	Non-Ferrous materials	08 Hours

a. Copper & it's alloys – (Gilding Metal, Cartridge Brass, Muntz Metal, Tin Bronze, Beryllium Bronze)
b. Aluminium& it's alloys – (LM5, Duralumin, Y-Alloy, Hinduminum).
c. Nickel and its Alloys (Invar, Inconel).
d. Titanium and its Alloys (α Alloys, α-β Alloys).
e. Cobalt and its Alloys (Stellite Alloys, Alnico).
f. Bearing Alloys (Classification, lead based alloys, tin based alloys)..

Unit V	Engineering Materials	5 Hours

a. Polymers – Introduction of polymer, Classification of polymer, Properties of polymer, Study of various polymers such as Bakelite, UF resin, MF resin, Nylon-66, natural and synthetic Rubber Plastics - Properties and applications, Paints.
b. Ceramic Materials - Introduction and types of ceramic materials, Introduction and types of abrasive materials, Introduction and types of Refractory materials, Cement - types, manufacturing process, setting & hardening, applications.
c. Composite Materials: -Introduction of composites, Constituents of composites, Types of composites, Processing of fibre reinforced composites, Failure of fibre reinforced composites.

Unit VI	Textile materials and Application of Nanotechnology	4 Hours

a. Textile materials: - Glass wool, polyester film, insulation felts and filters, various textile materials, their properties and applications, materials used for textiles – Ring Traveller, Bobbins, Picker, Shuttles.
b. Nanotechnology - Introduction to Nanotechnology, methods of synthesis of nanoparticles, Advantage and disadvantage of nanomaterials, Various applications of nanotechnology in textiles.

References Books:

1. Material Science by R.B. Gupta.
2. A Text book of Material Science by V.K. Manchanda.
3. Material Science and Engineering by V. Raghavan.
4. Material Science and Processes by S. K. HajraChoudhary.
5. Material Science and Metallurgy by V.D.Kodgire.
6. The Nanoscope by Dr. ParagDiwan& Ashish Bharadwaj.
7. Green Chemistry; A textbook by V. K. Ahluwalia.
8. Green Chemistry by Desai K. R.

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Second Year B. Tech. Textile Plant Engineering (Semester – III)
TPL234: MANUFACTURING PROCESSES - II

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

Course Objectives:
- ☐ To understand need of automation & stages involved in it. To get familiar with numerical control of machine tools & its concerned features.
- ☐ To know the concept of Non-traditional machining methods. To know various methods of protection of machined surfaces.
- ☐ To get familiar with hot working, cold working & forging of metals.
- ☐ To get acquainted with various metal joining processes.

Course Outcomes:
At the end of the course, students will be able to
- ☐ To describe need of automation, NC machines & their concerned features with the help of diagrams.
- ☐ To explain the principle, working, applications, advantages & dis-advantages of Non-traditional machining methods with the help of diagrams. To describe various methods of protection of machined surfaces.
- ☐ To describe hot working, cold working & forging of metals and its applications with the help of diagrams.
- ☐ To explain various methods of metal joining processes with the help of diagrams.

Course Contents		
Unit I	**Automation of manufacturing processes**	**03 Hours**

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

Unit II	**Numerical control of machine tools**	**08 Hours**

a. Introduction to NC machine, CNC machine – additional features, advantages, dis-advantages, application areas, parts suitable for CNC machines.
b. DNC machines, Classification of CNC machines – according to feedback control, according to control system features.
c. Axis identification in CNC machines, ATC & Tool magazine.

Unit III	**Non-traditional machining methods (NTMM)**	**07 Hours**

a. Introduction to NTMM & its classification.
b. NTMM's such as EDM, ECM, AJM, LBM, Plasma are cutting – principle, working, advantages, disadvantages & applications of each process.

Unit IV	**Protection of machined surfaces**	**05 Hours**

a. Corrosion - definition, types, factors affecting rate of corrosion, requirement of protection/coating.
b. Coating methods such as hot dipping, electroplating, galvanizing, metal spraying, tinning & painting.

Unit V	Mechanical working of metals	11 Hours
a.	Hot working of metals, cold working of metals, rolling, extrusion, drawing, metal spinning.	
b.	Forging -Introduction, various tools used, basic forging operations – hand forging, machine forging, open-die forging, close-die forging, forging defects & causes.	
Unit VI	Joining processes	05 Hours
a.	Welding & its types – arc welding, gas welding, resistance welding,	
b.	TIG welding, MIG welding, welding defects etc.	
c.	Brazing & soldering.	

References Books:

1. Elements of Workshop Technology – Vol – I &Vol - II by S. K. Hajara Choudhary, A.K. Hajara Choudhary & Nirjhar Roy.
2. A course in Workshop Technology – Vol – I & Vol - II by B. S. Raghuwanshi.
3. Production Technology by R. K. Jain.
4. CNC Machines by Pabla & Adithan.
5. CAD/CAM Principles & Operations by P. N. Rao.
6. Manufacturing Engineering & Technology by Serope Kalpakjian & Steven R. Schmid.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – III)
TPL235: YARN MANUFACTURING MACHINERY -II

Teaching Scheme: Lectures: 03 Hrs/ Week	Credits 03	Evaluation Scheme: 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. 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 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. **Production Calculations.**

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

a. **Study of maintenance aspects**.
b. **Assessment of performance of draw-frame**. 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. 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.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – III)
TPL236: FABRIC MANUFACTURING MACHINERY- II

Teaching Scheme: Lectures: 03 Hrs/ Week	Credits 03	Evaluation Scheme: 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 machine.
- ☐ To explain the various weaves like backed fabrics, bed ford cords, welt and pique with their characteristics, weaving requirements and applications.
- ☐ To explain the construction of double cloth, extra thread figuring and leno structure.

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 machine
- ☐ Understand the various weaves like backed fabrics, bed ford cords, welt and pique with their characteristics, weaving requirements and applications.
- ☐ Understand the construction of double cloth, extra thread figuring and leno structure.

	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	**Cord Structures**	**06 Hours**

   a. Bed ford Cords
   b. Welts and Pique

Unit IV	Backed Cloth	03 Hours
a. **Warp Backed Cloth** b. **Weft Backed Cloth**		

Unit V	Double Cloth	05 Hours
a. **Definition, Classification of Double cloth** b. **Construction of Double Cloth Structures**		

Unit VI	Extra Figuring and Leno Structure	05 Hours
a. **Figuring with extra threads** b. **Gauze and Leno**		

References Books:

1. Fundamentals of Yarn Winding by Milind Koranne
2. Modern Preparation & Weaving by A. Ormerod
3. Winding and Warping by M. K. Talukdar
4. Textile Design and Colour by Watson
5. Advanced Textile Design by Watson

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – III)
TPP237: MANUFACTURING PROCESSES - II LAB

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

List of Experiments

1	One assembly job in turning section containing following operations – facing, step turning, taper turning, knurling, threading etc.
2	Demonstration of CNC machine, milling machine & drilling machine.

Submission – Completed workshop diary.

Practical Examination

1	One assembly job on turning (Time duration 4 hours).
	Total – 1 Job for 4 Hrs. duration.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – III)
TPP238: YARN MANUFACTURING MACHINERY -II LAB

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

List of Experiments

1	Study of Blow-room line - Flow chart - Machine positioning in Blow-room
2	Study of Bale Opening and 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 feeding to card machine – Dimension, driving arrangement used, Speed calculations and Opening Intensity Calculation.
5	Study of De-dusting machines – Working, Dimension, Driving arrangement and calculations, and overall cleaning efficiency of Blow Room
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. Textile Plant Engineering (Semester– III)
TPP239:   FABRIC MANUFACTURING MACHINERY-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.
4	Study of sectional warping machine drive
5	Study of pirn winding machine.
6	Fabric analysis – Bed ford cord fabric
7	Fabric analysis – Backed Cloth
8	Fabric analysis – Double Cloth
9	Fabric analysis – Figuring with extra thread fabric
10	Fabric analysis – Leno fabric
11	Visit to winding unit
12	Visit to warping unit

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – III)
TPP240: TEXTILE MACHINE DRAWING LAB

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

Course Objectives:
- To draw IS conventions for machine drawing and symbols used in various branches of Engineering.
- To describe method to prepare free hand sketches, details and assembly drawings of machines.
- To illustrate free hand sketches, assembly and details drawings of textile machines.
- To explain use of CAD for machine drawing.

Course Outcomes:
At the end of the course, students will be able to
- Know and draw IS conventions for machine drawing and symbols used in Electrical, Electronics Engg. And hydraulics, pneumatics.
- Prepare free hand sketches of machine parts and assemblies of textile machines.
- Make assembly and details drawings of textile machines and machines in mechanical engineering.
- Use of CAD for machine drawing and layout.

Course Contents		
Unit I	**CONVENTIONS**	**03 Hours**
a. Study of IS conventions essential for machine drawing.		
Unit II	**SYMBOLS**	**03 Hours**
a. Study of electrical, electronic, hydraulic and pneumatic symbols used		
Unit III	**JOINTS**	**07 Hours**
a. Drawing sketches of couplings, cotter joint, knuckle joint, pipe joint, bearings, springs, pulleys, gears and gear drives.		
Unit IV	**FREE HAND SKETCHES**	**05 Hours**
a. Free hand sketches of a) Primary loom motions b) Gearing plan of spinning machines c) Differential gearing d) Comber index chart e) Detaching roller mechanism f) Drafting system of draw frame g) Coiler drive		
Unit V	**ASSEMBLY DRAWING**	**6 Hours**
a. Details and assembly drawings of machines / mechanisms assemblies containing 6-8 components		
Unit VI	**CAD**	**02 Hours**
a. Computer aided drafting used for layout of industrial units.		

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

List of Experiments	
1	One sheet on IS conventions.
2	One sheet on free hand sketches of textile mechanism.
3	One sheet based on weaving cam design.
4	Assembly & details drawing of flanged coupling, bearings, joints (knuckle or cotter joints), pulleys, springs, or gears consisting of 6-8 components
5	Assembly and details drawing of Single plate clutch.
6	Assembly and details drawing of tailstock
7	Assembly and details drawing of feed chuck valve
8	Assembly and details of textile mechanism Picking shaft assembly.
9	Assembly and details of textile mechanism feed roller of carding machine.
10	Assembly and details of textile mechanism lap roller drive at comber
11	Sheet representing hydraulic, pneumatic, Electrical, Electronic symbols and circuits, pipe joints
12	Sheet on machinery and plant layout with help of computer drafting.

Submission – Completed Journal containing 5 to 8 submission sheets from above list.

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

Teaching Scheme: Lectures: 02 Hrs/ Week		Evaluation Scheme: 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**

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

Sr. No.	Course Code	Name of the Course	Group	Theory Hrs/ Week	Tutorial Hrs/ Week	Practical Hrs/ Week	Total	Credits
				Teaching Scheme				
1	TPL251	Textile Mathematics - IV	BSC	3	-	-	3	3
2	TPL252	Textile Electronics	ESC	4	-	-	4	4
3	TPL253	Chemical Processing Machinery	PCC	3	-	-	3	3
4	TPL254	Fibre Testing	BSC	3	-	-	3	3
5	TPL255	Yarn Manufacturing Machinery - III	PCC	3	-	-	3	3
6	TPL256	Fabric Manufacturing Machinery - III	PCC	3	-	-	3	3
7	TPP257	Textile Electronics Lab	ESC	-	-	2	2	1
8	TPP258	Chemical Processing Machinery Lab	PCC	-	-	2	2	1
9	TPP259	Fibre Testing Lab	BSC	-	-	2	2	1
10	TPP260	Yarn Manufacturing Machinery - III Lab	PCC	-	-	2	2	1
11	TPP261	Fabric Manufacturing Machinery - III Lab	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. Textile Plant Engineering (Semester –IV)
TPL251: TEXTILE MATHEMATICS-IV

Teaching Scheme: Lectures: 03 Hrs./ Week	Credits 03	Evaluation Scheme: 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. Textile Plant Engineering (Semester – IV)
TPL252: TEXTILE ELECTRONICS

Teaching Scheme: Lectures: 04 Hrs/ Week	Credits 04	Evaluation Scheme: 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. Textile Plant Engineering (Semester – IV)
TPL253: CHEMICAL PROCESSING MACHINERY

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

Course Objectives:
- ☐ To describe unit operations in textile chemical processing and requirements from machines
- ☐ To describe design and construction of processing machines
- ☐ To describe working principles of processing machines
- ☐ To describe effect of machine parameter and process parameter on quality of textile material

Course Outcomes:
At the end of the course, students will be able to
- ☐ Explain unit operations in textile chemical processing and requirements from machines
- ☐ Describe design and construction of processing machines
- ☐ Explain working principles of processing machines
- ☐ Explain effect of machine parameter and process parameter on quality of textile material

Course Contents		
Unit I	**Mechanical Pre-treatment Machines**	**07 Hours**

a. Textile chemical processing: Introduction, Operation sequence
b. Preparation machines: Sewing machines, Fabric inspection methods, Fabric inspection machines, Batching machines
c. Shearing and cropping machine: Objectives, Construction and working for woven fabric, Surface shearing of Terry towels and Carpets, Efficiency of shearing and cropping
d. Gas singeing machine: Objectives, Construction and working, Machines for woven and knit goods, Efficiency of singeing

Unit II	**Chemical Pre-treatment Machines – Scouring and Bleaching Machines**	**06 Hours**

a. Objective and process of scouring and bleaching
b. Batch wise processing machines: Kier, Types of kiers and different methods of heating systems, Construction and working of kier, Jigger machine
c. Semi continuous processing machines: Pad-Roll system
d. Continuous processing machines: Vapor lock bleaching machine, J-Box unit, Continuous bleaching range

Unit III	**Mercerization Machines and Fabric Washing Machines**	**06 Hours**

a. Objective of mercerization, Changes brought in cotton, Properties of caustic
b. Yarn mercerization machines
c. Fabric mercerization machines and working principle: Pad-Chain, Pad-Chainless, Padless-Chainless, Mercerizing machine for knit goods, Caustic recovery plant
d. Fabric washing machines: Slack rope and Tight rope washing machines, Open width fabric washing machinery

Unit IV	**Dyeing Machines**	**10 Hours**

a. Basics of dyeing: Elements, Dye classification and Dyeing principles
b. Construction, basic requirements and desirable features of dyeing machines

c. Fibre dyeing machines: Loose stock dyeing machine
d. Yarn dyeing machines: Hank dyeing machines, Package dyeing machine
e. Fabric dyeing machines: Jigger dyeing machine, Types of Jigger, Winch dyeing machine, Horizontal beam dyeing machine
f. Jet dyeing machine: Conventional jet, Soft overflow jet and Airflow jet dyeing machines
g. Padding mangles: Construction, Types of padding mangles
h. Pad-Batch and Continuous open width fabric dyeing range

Unit V	Printing Machines	04 Hours

a. Printing principle, Operation sequence and general aspects of textile printing machinery
b. Construction and working of Flat Bed screen printing machine
c. Construction and working of Rotary screen printing machine
d. Screen preparation for Flat bed and Rotary screen printing
e. Study of Agers and Steamers

Unit VI	Finishing Machines	06 Hours

a. Drying machines: Vertical drying range, Float dryer, Hot flue dryer and Polymeriser
b. Stenter machine for drying and finishing, Heat Recovery system
c. Sanforising machine
d. Calendaring machine: Friction calendar, Schreiner calendar, Felt calendar
e. Steam and thermic fluid circulation systems, Steam and water consumption

References Books:

1. R. S. Bhagwat, Handbook of Textile Processing Machinery, Colour Publications Pvt. Ltd., ISBN: 81-7525-077-1 (1983).
2. S. V. Gokhale and A. K. Dhingra, Maintenance in Chemical Processing, ATIRA, (1994).
3. C. Duckworth, Engineering in Textile Coloration, Society of Dyers and Colourists, ISBN: 0901956317, (1983).
4. National Textile Corporation, Technical Specification of Wet Processing Machinery, National Textile Corporation
5. V. A. Shenai, Technology of Bleaching and Mercerizing, Volume 3, Sevak Publications (2003).
6. V. A. Shenai, Technology of Dyeing, Volume 6, Sevak Publications, (1994).
7. V. A. Shenai, Technology of Printing, Volume 4, Sevak Publications, (1994).
8. V. A. Shenai, Technology of Finishing, Volume 10, Sevak Publications, (1990).
9. S. R. Karmakar, Chemical Technology in the Pre-treatment Processes of Textiles, Elsevier Science B. V., (1999).
10. L. W. C. Miles, Textile Printing, Society of Dyers and Colourists, ISBN: 0901956791(2003).
11. J. T. Marsh, An Introduction to Textile Finishing, Chapman and Hall Ltd., (1948).

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – IV)
TPL254: FIBRE TESTING

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

Course Objectives:
- To explain significance and selection of sample
- To discuss technical significance of fibre properties.
- To describe testing methodologies for evaluation of fibre properties.
- To explain significance of moisture in textiles and its measurement.

Course Outcomes:
At the end of the course, students will be able to
- To select representative sample.
- To understand technical significance of fibre properties.
- To test and interpret results of fibre properties.
- To understand moisture fibre relations.

Course Contents		
Unit I	**Sampling for determination of fibre properties**	**05 Hours**
	Necessity of sampling, Terms: Population, Sample, Random sample, biased sample, Factors governing sampling, Sampling methods - Zoning method, Squaring method, Cut squaring method, Core sampling method.	
Unit II	**Longitudinal dimensions (Fibre length)**	**08 Hours**
	Concept, Technical Significance of fibre length, Staple length of cotton, Length- frequency diagrams, Fibre length measurement - Oil plate method , Comb sorter method, Scanning method - Digital Fibrograph.	
Unit III	**Transverse dimensions (Fineness & Maturity)**	**06 Hours**
	a. **Fibre Fineness:** Concept, Measures of fineness, Technical significance of fineness, Measurement of fineness - Microscopic method, Gravimetric method, Airflow method - Sheffield Micronaire. b. **Fibre Maturity:** Concept, Measures of maturity, Technical significance of maturity, Measurement of maturity - Caustic soda method, Polarized light method, Differential dyeing method.	
Unit IV	**Fibre strength**	**08 Hours**
	Terms and definitions, Stress-strain curve, Importance of Tensile properties, Factors influencing fibre strength, Types of loading, Measurement of fibre strength - Single fibre strength –Strain gauge transducer principle, Bundle fibre strength – Pendulum lever principle, Comparison of Single fibre strength and Bundle fibre strength.	
Unit V	**Moisture relations and testing**	**05 Hours**
	Terms and definitions, Effect of moisture on textiles, Regain–humidity relationships, factors affecting moisture regain, Measurement of atmospheric conditions- dry and wet bulb hygrometer, hair hygrometer, electrolytic hygrometer, measurement of regain –oven dry method, methods based on resistance and capacitance principles.	

Unit VI	Miscellaneous testing and modern fibre testing-	07 Hours

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

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

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

d. **Fibre Density –** Concept, Measurement of fibre density

e. **Fibre Quality Index and its significance**

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

References Books:

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

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – IV)
TPL255: YARN MANUFACTURING MACHINERY- III

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

Course Objectives:
- To explain the need, principles and effects of comber preparatory, combing, speed frame and ring frame process.
- To discuss the construction, design, mechanisms and machine parameters of comber preparatory, combing, speed frame and ring frame machines.
- To discuss the method to enumerate process parameters and performance of combing preparation, combing, speed frame and ring frame processing.
- To explain utilities, maintenance needs, and features of modern lap making, combing, speed frame and ring frame machines.

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 and ring frame.
- Explain the constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber, speed frame and ring frame.
- Enumerate performance parameters related to combing preparatory, comber, speed frame and ring frame.
- Explain the utilities, maintenance needs and developments in combing preparatory, combing, speed frame and ring frame.

Course Contents

Unit I	Comber Preparatory	06 Hours

a. **Requirements of good lap –** importance of number of passages, importance of good lap, 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	09 Hours

a. **Objects of combing process. Study of combing 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	08 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	08 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	Assessment of Ring Frame Performance and Modern Development	03 Hours

a. Developments in Ring Frame Online 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.

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.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – IV)
TPL256: FABRIC MANUFACTURING MACHINERY - III

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

Course Objectives:
- ☐ To explain the construction and working of sizing machine.
- ☐ To explain the design features of automatic loom.
- ☐ To explain the construction of pile fabric structure.
- ☐ To explain the construction and working of projectile weaving machines

Course Outcomes:
At the end of the course, students will be able to
- ☐ Explain the construction and working of sizing machine
- ☐ Understand the design features of automatic loom
- ☐ Understand the construction of pile fabric structure
- ☐ Understand the construction and working of projectile weaving machines

Course Contents		
Unit I	**Sizing**	**10 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
e. Calculations related to production, efficiency, size concentration, size pick up, stretch, drying, warp count, etc.

Unit II	**Automatic Weaving**	**08 Hours**

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

Unit III	**Fabric Structure - I**	**04 Hours**

a. Warp pile – Terry pile structure
b. Warp pile fabrics produced with the aid of wires
c. Warp pile fabric produced by using face to face weaving principle

Unit IV	Fabric Structure - II	04 Hours

a. Introduction to tufted carpet structure
b. Weft pile

Unit V	Introduction to Shuttleless Weaving Machines	03 Hours

a. Limitation of shuttle loom
b. Advantages of shuttleless weaving machines
c. Classification of shuttleless weaving machines

Unit VI	Projectile Weaving	10 Hours

a. Weft insertion principle of projectile weaving machine
b. History of Projectile weaving machine
c. Projectile picking motion, projectile acceleration & retardation, torsion rod details
d. picking phases
e. Projectile preparation for picking, Receiving unit
f. Specifications of projectiles & grippers for various applications
g. Beat-up motion, Selvedge motion,
h. Let-off motion (Mechanical & power), Take-up motion, their advantages in relation to shuttle loom motions
i. 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.

References Books:

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

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – IV)
TPP257:   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. Textile Plant Engineering (Semester – IV)
TPP258:   CHEMICAL PROCESSING MACHINERY LAB

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

List of Experiments

1	Study of gas singeing machine
2	Study of jigger machine
3	Study of mercerization machine
4	Study of package dyeing machine
5	Study of winch dyeing machine
6	Study of soft flow dyeing machine
7	Study of airflow dyeing machine
8	Study of padding mangle
9	Study of flat bed and rotary screen-printing machine
10	Study of vertical drying range
11	Study of stenter machine
12	Industrial visit to chemical process house

Submission – Completed Journal

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – IV)
TPP259: FIBRE TESTING LAB

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

List of Experiments

1	Study of Zoning technique for selection of fibre sample.
2	Fibre Length by using Grease Plate Method.
3	Comb Sorter method for estimation of fibre length parameters.
4	Fibre Fineness by Cut-Weight Method.
5	Measurement of fibre fineness by airflow principle.
6	Fibre Maturity Measurement by Caustic Soda Method
7	Determination of trash content in cotton using Trash Analyzer.
8	Determination of Neps in Card web by Shirley Template.
9	Determination of moisture content and regain by oven dry method.
10	Determination of moisture content by Shirley Moisture meter
11	Study of fibre parameters on AFIS.
12	Study of fibre parameters on HVI.

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Plant Engineering (Semester – IV)
TPP260: YARN MANUFACTURING MACHINERY - III LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks SEE: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 of ring frame settings and spinning geometry.
11	Study of building mechanism of Ring frame.
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. Textile Plant Engineering (Semester – IV) TPP261: FABRIC MANUFACTURING MACHINERY -III LAB		
Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01		Evaluation Scheme: CIE: 50 Mark

List of Experiments

1	General study of projectile machine and drive arrangements for various motions.
2	Study of projectile picking motion.
3	Study of style change process on projectile weaving machine.
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 – Terry Pile
10	Fabric analysis – Velveteen
11	Visit to sizing unit
12	Visit to autoloom and projectile weaving units

Submission – Completed Journal.

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

Teaching Scheme: Tutorial: 02 Hrs / Week		Evaluation Scheme: 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