DKTE Society's

TEXTILE & ENGINEERING INSTITUTE

Rajwada, Ichalkaranji 416115

(An Autonomous Institute)

DEPARTMENT: TEXTILES

CURRICULUM

B. Tech. Textile Technology Program

Second Year

With Effect From

2021-2022

DKTE

Promoting Excellence in Teaching
Learning & Research

DKTES Textile and Engineering Institute, Ichalkaranji

(An Autonomous Institute)

Teaching and evaluation Scheme for year 2021-22

Second Year B. Tech. (Semester – III) In Textile Technology

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme					
									Theory			Practical		TOTAL
				L	T	P	Contact Hrs/wk		CIE		SEE	CIE	SEE	
									SE-I	SE-II				
1	TTL231	Textile Mathematics - III	BSC	3	-	-	3	3	25	25	50	-	-	100
2	TTL232	Thermal Engineering	ESC	3	-	-	3	3	25	25	50	-	-	100
3	TTL233	Manmade Fibres and Yarns	PCC	3	-	-	3	3	25	25	50	-	-	100
4	TTL234	Fibre Testing	PCC	3	-	-	3	3	25	25	50	-	-	100
5	TTL235	Yarn Forming Technology - II	PCC	3	-	-	3	3	25	25	50	-	-	100
6	TTL236	Fabric Forming Technology - II	PCC	3	-	-	3	3	25	25	50	-	-	100
7	TTP237	Fibre Testing Lab	PCC	-	-	2	2	1	-	-	-	50	50	100
8	TTP238	Yarn Forming Technology - II Lab	PCC	-	-	2	2	1	-	-	-	50	-	50
9	TTP239	Fabric Forming Technology - II Lab	PCC	-	-	2	2	1	-	-	-	50	50	100
10	TTD240	Textile Design and Colour Lab	PCC	-	2	-	2	2	-	-	-	50	-	50
11	ADL201-A	Environmental Studies	MC	2	-	2	2	--	-	-	-	-	-	--
		Total		**20**	**-**	**08**	**28**	**23**	**150**	**150**	**300**	**200**	**100**	**900**

L- Lecture
T-Tutorial
P-Practical

SE-I : Semester Examination-I
SE-II : Semester Examination-II

CIE – Continuous In Semester Evaluation
SEE- Semester End Examination

Course Category	HSMC (Hum. & Social Sc., Mgt)	BSC (Basic Sc.)	ESC Engg. Sc.)	PCC (Prof. Core Courses)	PEC (Prof. Elect. Courses)	OEC (Open Elct. Courses)	MC (Mandatory Courses)	PST (Project / Seminar / Ind. Training)
Credits	-	03	03	17	--	--	--	--
Cumulative Sum	02	17	13	28	--	--	--	-

Progressive Total Credits: 37+23 =60

DKTES Textile and Engineering Institute, Ichalkaranji

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Teaching and evaluation Scheme for year 2021-22

Second Year B. Tech. (Semester – IV) In Textile Technology

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme					
									Theory			Practical		TOTAL
				L	T	P	Contact Hrs/wk		CIE		SEE	CIE	SEE	
									SE-I	SE-II				
1	TTL251	Textile Mathematics - IV	BSC	3	-	-	3	3	25	25	50	-	-	100
2	TTL252	Textile Electronics	ESC	4	-	-	4	4	25	25	50	-	-	100
3	TTL253	Chemical Processing of Textiles - I	PCC	3	-	-	3	3	25	25	50	-	-	100
4	TTL254	Yarn & Fabric Testing	PCC	3	-	-	3	3	25	25	50	-	-	100
5	TTL255	Yarn Forming Technology - III	PCC	3	-	-	3	3	25	25	50	-	-	100
6	TTL256	Fabric Forming Technology -III	PCC	3	-	-	3	3	25	25	50	-	-	100
7	TTP257	Textile Electronics Lab	ESC	-	-	2	2	1	-	--	-	50	50	100
8	TTP258	Chemical Processing of Textiles - I Lab	PCC	-	-	2	2	1	-	-	-	50	-	50
9	TTP259	Yarn & Fabric Testing Lab	PCC	-	-	2	2	1	-	-	-	50	-	50
10	TTP260	Yarn Forming Technology - III Lab	PCC	-	-	2	2	1	-	-	-	50	50	100
11	TTP261	Fabric Forming Technology - III Lab	PCC	-	-	2	2	1	-	-	-	50	-	50
12	ADL201	Environmental Studies	MC	-	2	-	2	--	-	-	70	30	-	100
		Total		**19**	**2**	**10**	**31**	**24**	**150**	**150**	**370**	**280**	**100**	**1050**

L- Lecture
T-Tutorial
P-Practical

SE-I : Semester Examination-I
SE-II : Semester Examination-II

CIE – Continuous In Semester Evaluation
SEE- Semester End Examination

Course Category	HSMC (Hum. & Social Sc., Mgt)	BSC (Basic Sc.)	ESC Engg. Sc.)	PCC (Prof. Core Courses)	PEC (Prof. Elect. Courses)	OEC (Open Elct. Courses)	MC (Mandatory Courses)	PST (Project / Seminar / Ind. Training)
Credits	--	03	05	16	--	--	--	--
Cumulative Sum	02	20	19	44	--	--	--	-

Progressive Total Credits: 60+24 =84

Second Year B. Tech 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	TTL231	Textile Mathematics - III	BSC	3	-	-	3	3
2	TTL232	Thermal Engineering	ESC	3	-	-	3	3
3	TTL233	Manmade Fibres and Yarns	PCC	3	-	-	3	3
4	TTL234	Fibre Testing	PCC	3	-	-	3	3
5	TTL235	Yarn Forming Technology - II	PCC	3	-	-	3	3
6	TTL236	Fabric Forming Technology - II	PCC	3	-	-	3	3
7	TTP237	Fibre Testing Lab	PCC	-	-	2	2	1
8	TTP238	Yarn Forming Technology - II Lab	PCC	-	-	2	2	1
9	TTP239	Fabric Forming Technology - II Lab	PCC	-	-	2	2	1
10	TTD240	Textile Design and Colour Lab	PCC	-	2	-	2	2
11	ADL201-A	Environmental Studies	MC	2	-	-	2	--
		Total		**20**	**02**	**06**	**30**	**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 Technology (Semester – III)
TTL231: 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 Technology (Semester – III)
TTL232: 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 Technology (Semester –III)
TTL233: MANMADE FIBRES AND YARNS

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 manufacturing process of regenerated and synthetic manmade fibres
- To explain the structure and properties of regenerated and synthetic manmade fibres.
- To explain the applications of regenerated and synthetic manmade fibres.
- To describe the manufacturing, characteristics, and applications of important high performance fibres

Course Outcomes:

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

- Illustrate the manufacturing process of regenerated and synthetic man-made fibres
- Analyze the structure, properties, and applications of regenerated and synthetic manmade fibres
- Identify the applications for regenerated and synthetic manmade fibres.
- Illustrate the manufacturing process, characteristics, and applications of high performance fibres

Course Contents

Unit I	Cellulosic/Regenerated Fibres: Part I	06 Hours

a. **Viscose Rayon:** Process of manufacturing Viscose Rayon fibres, physical and chemical properties of Viscose Rayon, Applications of Viscose Rayon fibres.
b. **Tencel Fibre:** Manufacturing process of Tencel fibres, properties, and applications of Tencel fibres, Difference in Viscose Rayon and Tencel fibres, Sustainability of Tencel fibres.

Unit II	Cellulosic/Regenerated Fibres: Part II	06 Hours

a. **Acetate Fibres:** Production, properties and application of Cellulose Acetate and Cellulose Triacetate fibres.
b. **Cuprammonium Rayon:** Production, properties, and applications of Cuprammonium Rayon.

Unit III	Polyester and Polyamide Fibres	08 Hours

a. **Polyester Fibres:** Raw materials used to manufacture Polyester fibre, manufacturing of Polyester fibre, physical and chemical properties of the Polyester fibre, Applications of PET fibre.
b. Introduction to Polyamide fibres, types of Polyamide fibres.
c. **Nylon 6:** Raw materials and manufacturing process of Nylon 6, physical and chemical properties, and applications of Nylon 6 fibres.
d. **Nylon 66:** Raw materials and manufacturing process of Nylon 66, physical and chemical properties, and applications of Nylon 66 fibres.

Unit IV	Acrylic and Elastomeric Fibres	06 Hours

a. **Acrylic fibres:** Concepts of Acrylic and Modacrylic fibres, manufacturing process, properties, and applications of Acrylic fibres.
b. **Elastomeric Fibres:** Elastomeric fibre production, extension and recovery mechanism of Elastomeric fibres, properties, and application of Elastomeric fibres.

Unit V	High Performance Fibres	09 Hours

a. Introduction to High Performance Fibres.
b. **Aramid Fibres:** Manufacturing, characteristics, and applications of Aramid Fibres.
c. **Carbon Fibres:** Manufacturing, characteristics, and applications of Carbon Fibres.
d. **High Performance Polyethylene Fibres:** Manufacturing, characteristics, and applications of High Performance Polyethylene Fibres.
e. **Fully Aromatic Polyester fibres:** Manufacturing, characteristics, and applications of Fully Aromatic Polyester fibres.

Unit VI	Nanofibre Technology	04 Hours

c. Introduction to Nanofibre Technology.
d. Manufacturing techniques of Nanofibres.
e. Properties and applications of Nanofibres.

References Books:

1. V. B. Gupta, V. K. Kothari, Manufactured Fibre Technology, Chapman and Hall, London.1997. ISBN: 9789401064736.
2. 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. Eichhorn, J.W. S. Hearle, M. Jaffe, T. Kikutani, Handbook of Textile Fibre Structure, Volume 2: Natural, Regenerated, Inorganic, and Specialist Fibres, CRC Press, Woodhead Publishing in Textiles, 2009. ISBN: 9781439820728
7. J. W. S. Hearle, High-Performance Fibres, Woodhead Publishing, 2001. ISBN: 9781855737549.
8. P. Brown, K. Stevens, Nanofibers and nanotechnology in textiles, Woodhead Publishing, in association with The Textile Institute, 2007. ISBN: 9781845691059.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Technology (Semester – III)
TTL234: 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 Technology (Semester – III)
TTL235: YARN FORMING TECHNOLOGY- 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
c. **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 Technology (Semester – III)
TTL236: 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 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 Technology (Semester – III)
TTP237: FIBRE TESTING LAB

Lab Scheme: Practicals: 02 Hrs/ Week	Credits 01	Evaluation Scheme: CIE: 50 Marks SEE: 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 Technology (Semester – III)
TTP238: YARN FORMING TECHNOLOGY -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 Technology (Semester – III)
TTP239: 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.
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 Technology (Semester –III)
TTD240: 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. 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 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	TTL251	Textile Mathematics - IV	BSC	3	-	-	3	3
2	TTL252	Textile Electronics	ESC	4	-	-	4	4
3	TTL253	Chemical Processing of Textiles - I	PCC	3	-	-	3	3
4	TTL254	Yarn & Fabric Testing	PCC	3	-	-	3	3
5	TTL255	Yarn Forming Technology - III	PCC	3	-	-	3	3
6	TTL256	Fabric Forming Technology -III	PCC	3	-	-	3	3
7	TTP257	Textile Electronics Lab	ESC	-	-	2	2	1
8	TTP258	Chemical Processing of Textiles - I Lab	PCC	-	-	2	2	1
9	TTP259	Yarn & Fabric Testing Lab	PCC	-	-	2	2	1
10	TTP260	Yarn Forming Technology - III Lab	PCC	-	-	2	2	1
11	TTP261	Fabric Forming Technology - 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 Technology (Semester –IV)
TTL251: 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 Technology (Semester – IV)
TTL252: 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 Technology (Semester – III)
TTL253: CHEMICAL PROCESSING OF TEXTILES- I

Teaching Scheme: Lectures: 03 Hrs/ Week	Credits 03	Evaluation Scheme: 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. Textile Technology (Semester – IV)
TTL254: YARN AND FABRIC TESTING

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

Course Objectives:

- To discuss significance of yarn and fabric properties.
- To discuss the factors affecting yarn and fabric properties.
- To explain principle and testing methodology of yarn properties.
- To explain principle and testing methodology of fabric properties.

Course Outcomes:

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

- Understand significance of yarn and fabric properties.
- Discuss the factors affecting yarn and fabric properties.
- Test yarn properties and interpret the results.
- Test fabric properties and interpret the results.

Course Contents

Unit I	Count and Twist in Yarn	07 Hours

a. Yarn Number:

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

b. Yarn Twist:

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

Unit II	Mechanical Properties of Yarns and Fabric:	12 Hours

a. Yarn Strength

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

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

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

b. Mechanical Properties of Fabric

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

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

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

Unit III	Evenness of Yarn	10 Hours

a. Concept, Classification of irregularity, causes of irregularity, Measures of irregularity, Basic irregularity, Index of irregularity. Addition of irregularity, Measurement of yarn irregularity - Visual examination, Cutting & weighing method, Electronic capacitance principle, Variation of thickness under compression, Analysis of irregularity – Variance length curves, spectrogram, Importance of yarn uniformity. Imperfections – Concept, Causes and importance.
b. Classimat faults: Classification of faults and its causes. Principle & working of Classimat tester.
c. Hairiness in spun yarn - Concept, Causes, Reduction & Measurement of hairiness- Photoelectric method.

Unit IV	Structural Properties of Fabric	04 Hours

a) **Thickness** – Definition, Significance, Shirley method of measurement of fabric thickness.
b) **Crimp of Yarn In Fabric**: Definition, Measurement, Effect on Fabric Properties.
c) **Cover factor** – Definition, Derivation of cover factor, Significance

Unit V	Aesthetic Properties of Fabric	03 Hours

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

Unit VI	Transport Properties of Fabric	03 Hours

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

References Books:

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

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Technology (Semester – IV)
TTL255: YARN FORMING TECHNOLOGY -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 working principles and process parameters of combing preparatory, comber, speed frame and ring frame.
- To describe constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber, speed frame and ring frame.
- To Explanation to enumerate parameters influencing combing preparatory, comber, speed frame and ring frame.
- To Describe utilities, maintenance needs, methods to evaluate the processes. Enumerate features of modern combing preparatory, comber, speed frame and ring frame 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 and ring frame.
- Demonstrate the constructional details and design aspects of machine parts and mechanisms involved in combing preparatory, comber, speed frame and ring frame.
- Estimate parameters related to combing preparatory, comber, speed frame and ring frame.
- Explain maintenance needs, methods to evaluate the processes. Demonstrate features of modern combing preparatory, comber, speed frame and ring frame.

Course Contents

Unit I	Comber Preparatory	06 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	09 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

d. **Assessment of Comber Performance –** Norms for production, speed. Combing efficiency, Fractionating efficiency of comber. Influence of combing operation on quality
e. **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 Traveler, 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 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.

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 Technology (Semester – IV)
TTL256: FABRIC FORMING TECHNOLOGY– 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 Technology (Semester – IV)
TTP257: 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 Technology (Semester – IV)
TTP258: 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. Textile Technology (Semester – IV)
TTP259: YARN AND FABRIC TESTING LAB

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

List of Experiments

1	Determination of yarn Linear Density.
2	Determination of twist in single yarn.
3	Determination of twist in double yarn.
4	Determination of single yarn strength.
5	Determination of yarn lea strength.
6	Estimation of crease recovery angle
7	Evaluation of yarn unevenness by cut weight principle.
8	Evaluation of stiffness of fabric.
9	Determination of fabric strip strength.
10	Determination of tearing strength of fabric.
11	Assessment of abrasion resistance of fabric.
12	Estimation of drapability of fabric.

Submission – Completed Journal.

DKTES Textile and Engineering Institute, Ichalkaranji
Second Year B. Tech. Textile Technology (Semester – IV)
TTP260: YARN FORMING TECHNOLOGY -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 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 Technology (Semester – IV)
TTP261: FABRIC FORMING TECHNOLOGY -III LAB

Lab Scheme: Practical: 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 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