Punjab Technical University

Jalandhar

Textile Engg.

Punjab Technical University, Jalandhar
B.Tech. Textile Engg.
Scheme of Syllabi (3rd Semester)

Code	Subject	L	T	P	EXT.	INT.	TOTAL
AM-201	Applied Mathematics-III	3	1	0	60	40	100
TT-201	Textile Fibre-I	3	1	0	60	40	100
TT-203	Introduction of Textile Engineering	3	1	0	60	40	100
TT-205	Polymer and Fibre Science	3	1	0	60	40	100
CS-251	Elements of Computer Graphics	3	1	0	60	40	100
ME-251	Elements of Mechanical Engineering	3	1	0	60	40	100
TT-207	Laboratory-I (Textile Fibre)	0	0	2	30	20	50
TT-209	Laboratory-II (Introduction of Textile Engg.)	0	0	2	30	20	50
CS-253	Laboratory-III(Elements of Computer Graphics)	0	0	2	30	20	50
ME-253	Laboratory-IV (Elements of Mechanical Engg.)	0	0	2	30	20	50
	TOTAL						**800**

Punjab Technical University, Jalandhar
B.Tech. Textile Engg.
Scheme of Syllabi (4th Semester)

Course Code	Name of the subject	Weekly Load L T P	Total Teaching load	Maximum Marks		
				Internal	External	Total
TT-202	Yarn Manufacture-I	3 1 0	4	40	60	100
TT-204	Textile Fibre-II	3 1 0	4	40	60	100
TT-206	Fabric Manufacture-I	3 1 0	4	40	60	100
TT-208	Textile Chemical Processing-I	3 1 0	4	40	60	100
TT-210	Fabric Structure & Analysis	3 1 0	4	40	60	100
IC-252	Elements of Instrumentation & Control Engg.	3 1 0	4	40	60	100
TT-212	Lab.V (Yarn Manufacture)	0 0 2	2	30	20	50
TT-214	Lab.VI (Fabric Manufacture)	0 0 2	2	30	20	50
TT-216	Lab.VII(Textile Chemical Processing)	0 0 2	2	30	20	50
TT-218	Lab.VIII(Fabric Structure & Analysis)	0 0 2	2	30	20	50
	General fitness					100
Total			32			900

L = Lecture, T = Tutorial / Seminar, P = Practical / Project

****There should be industrial/institutional training of 6 weeks duration in the summer vacation after 4th semester**

Punjab Technical University, Jalandhar
B.Tech. Textile Engg.
Scheme of Syllabi (5th Semester)

Course Code	Semester	Name of the subject	Weekly Load L T P	Total Teaching load	Maximum Marks		
					Internal	External	Total
TT-301	5th	Properties of Fibres	3 1 0	4	40	60	100
TT-303	5th	Yarn Manufacture-II	3 1 0	4	40	60	100
TT-305	5th	Fabric Manufacture-II	3 1 0	4	40	60	100
TT-307	5th	Textile Chemical Processing-II	3 1 0	4	40	60	100
TT-309	5th	Textile Testing	3 1 0	4	40	60	100
HUM-301	5th	Introduction to Engg. Economics & Management	3 1 0	4	40	60	100
TT-311	5th	Lab.IX (Yarn Manufacture)	0 0 2	2	30	20	50
TT-313	5th	Lab. X (Fabric Manufacture)	0 0 2	2	30	20	50
TT-315	5th	Lab.XI (Textile Chemical Processing)	0 0 3	3	30	20	50
TT-317	5th	Lab.XII(Textile Testing)	0 0 3	3	30	20	50
		Industrial Training			60	40	100
Total				34			900

L = Lecture, T = Tutorial / Seminar, P = Practical / Project

Punjab Technical University, Jalandhar
B.Tech. Textile Engg.
Scheme of Syllabi (6th / 7th Semester)

Course Code	Semester	Name of the subject	Weekly Load L T P	Total Teaching load	Maximum Marks		
					Internal	External	Total
TT-302	6th	Industrial Training			500	500	1000

L = Lecture, T = Tutorial / Seminar, P = Practical / Project

*** Industrial training will be pursed during the 6th semester.

Punjab Technical University, Jalandhar
B.Tech. Textile Engg.
Scheme of Syllabi (6th / 7th Semester)

Course code	Semester	Name of the subject	Weekly Load L T P	Total Teaching load	Maximum Marks		
					Internal	External	Total
TT-401	7th	Theory of Textile Structure	3 1 0	4	40	60	100
TT-403	7th	Process control in Spinning	3 1 0	4	40	60	100
TT-405	7th	Knitting Technology	3 1 0	4	40	60	100
TT-407	7th	Quality Control in Textile Industry	3 1 0	4	40	60	100
TT-409,415 417,419	7th	Departmental Elective-I	3 1 0	4	40	60	100
TT-411	7th	Human Resource Management	3 1 0	4	40	60	100
TT-413	7th	Lab.XIII (Knitting Technology)	0 0 2	2	30	20	50
		General Fitness					100
Total				26			750

L = Lecture, T = Tutorial / Seminar, P = Practical / Project

Punjab Technical University, Jalandhar
B.Tech. Textile Engg.
Scheme of Syllabi (8th Semester)

Course Code.	Semester	Name of the subject	Weekly Load L T P	Total Teaching load	Maximum Marks		
					Internal	External	Total
TT-402	8th	Mechanics of Textile Processes	3 1 0	4	40	60	100
TT-404	8th	Mill Management, lay out and Economics	3 1 0	4	40	60	100
TT-408,410 412,414 416,418	8th	Departmental Elective-II	3 1 0	4	40	60	100
TT-420,422 424,426, 428,430	8th	Departmental Elective-III	3 1 0	4	40	60	100
TT-432,434, 436,438, 440	8th	Departmental Elective-IV	3 1 0	4	40	60	100
TT-406	8th	Project	0 0 8	8	120	80	200
		General Fitness			100		100
Total				28			800

L = Lecture, T = Tutorial / Seminar, P = Practical / Project

List of Departmental Electives:

DEPARTMENT ELECTIVE-I

Sr. No.	Course Code	Course Title
1.	TT-409	Non Woven Technology
2.	TT-415	Multi fibre process
3.	TT-417	Post Spinning Operation
4.	TT-419	Advanced dyeing and printing Technology

DEPARTMENT ELECTIVE-II

Sr. No.	Course Code	Course Title
1.	TT-408	Texturing Technology
2.	TT-410	Process Control in Weaving & Knitting
3.	TT-412	Advanced Theory of Textile Structure
4.	TT-414	Technical Textiles
5.	TT-416	High Performance & Specialty Fibers
6.	TT-418	Clothing Science

DEPARTMENT ELECTIVE-III

Sr. No.	Course Code	Course Title
1.	TT-420	Non Conventional Yarn Manufacture
2.	TT-422	Non Conventional Fabric Manufacture
3	TT-424	Characterization of Fibre & Polymers
4.	TT-426	Advanced Fabric Structure
5.	TT-428	Process Control in Chemical Processing
6.	TT-430	Polymer & Surfactants for Textiles

DEPARTMENT ELECTIVE-IV

Sr. No.	Course Code	Course Title
1.	TT-432	Garment Manufacturing Technology
2.	TT-434	Computer in Textiles
3.	TT-436	Marketing & Financial Management in Textiles
4.	TT-438	Waste Management and Pollution Control in Textile Industry
5.	TT-440	Woolen Technology

AM 201 MATHEMATICS-III

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

1. Fourier Series Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different wave forms.

2. Laplace Transforms Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

3. Special Functions Power series solution of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation, Error function and its properties.

4. Partial Differential Equations Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients Applications: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation, solution by the method of separation of variables. Laplacian in polar coordinates.

5. Functions of Complex Variable Limits, continuity, derivative of complex functions, analytic function, Cauchy-Riemann equation, conjugate functions, harmonic functions; Conformal Mapping: Mapping of a complex function, conformal mapping, standard transforms, mapping of standard elementary transformations, complex potential, applications to fluid flow problems; Complex Integration : Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions, singular points, poles, residue, complex integration using the method of residues, evaluation of real integrals by contour integration.

Books

Advanced Engineering Mathematics by Kreyszing Erwin ; Wiley Eastern,
Higher Engineering Mathematics by BS Grewal : Khanna Publishers
Numerical Solutions of Differential Equations by NK Jain ; Prentice Hall
Differential Equations by Sharma and Gupta ; Krishna Prakashan Media

TT-201 TEXTILE FIBRE –I

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction :

Classification of textile fibers.

Essential and desirable properties of textile fibers.

Essential properties of fibre forming polymers.

Orientation and crystallinity in fibres.

Physical & Chemical properties.

Structure and uses of major natural fibres (eg. cotton, flax, jute, wool, silk).

Correlation of structures with properties of natural fibres.

Introduction to man made fibres. Basic production systems for the man made fibre. Selection of a polymer, selection of a suitable process for conversion of polymer to fibre, basic idea about melt, wet and dry spinning systems.

Production, Physical & Chemical structure, properties and uses of regenerated fibres (eg. viscose, polynosic, cellulose acetate).

Recomended Books:-

1. Textile Science E.P.G Gohl & Valensky
2. Hand Book of Rayon Century Rayon
3. Textile Fibre V.A.Shenai
4. Chemical Technology of fibrins material Sadov

TT-203 Introduction of Textile Engineering

Internal Marks: 40	**L T P**
External Marks: 60	**3 1 0**
Total Marks : 100	

Topic including job & entrepreneural opportunities of Textile technologists.

Introduction to the language of textile and process flow of fibres up to finished product. Classification of fibre. Basic requirements of fibre forming polymers and fibres. Elementary idea of polymerisation.

Crystallinity & orientation. Numbering system. Elementary idea about the objects of each machines used in textile processing. Woven knitted and non woven fabric production.

Basic idea of non conventional spinning & weaving machineries. Elementary idea of desizing, scouring, bleaching, dyeing, printing & finishing processes. Different end uses of finished products.

Ref.Books:-

1. Textile Fibre V.A.Senhai
2. Manual of Textile Tech. W.Klein
3. Essential Elements of Textile Calculations T.K.Pattabhiram
4. Textile Science Gohl & Valenski

TT-205 Polymer & Fibre Science

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Classification of polymers: i.e. organic & elemento organic polymers, co-ordination or chelate polymers, inorganic polymers. Specific features of polymer structures,e.g, regularity & irregularity, molecular wt. & size. Determination of molecular wt. & effect of molecular wt. on properties of polymer/fibre. Configuration and conformation of molecules,practical importance of chain flexibility.

Concepts of polymer structure. Basic idea about methods of investigation of polymer structure e.g, x-ray diffraction, Electron microscope. Structure of amorphous polymers. Physical state of polymers. Concept of rubbery state & rubber elasticity. The glassy state. Transition from a glassy to rubbery state. Melting of polymers. Practical importance of the phases and aggregation states of polymers. Deformation of glassy and crystalline polymers. Basic concepts of strength & durability. The mechanism of polymer fracture. Effect of relaxation processes on strength properties. Effect of size of molecule, fillers, cross link etc. on mechanical property. Methods of polymerisation. Methods & kinetics of condensation & addition polymerisation with special reference to polyester, polyamide, acrylic and polypropylenes.

Recomended Books:-

1) Polymer Science W.Billmeger
2) Physical Chemistry of Polymers A.Tager
3) Polymer Science Gowareker
4) An Introduction to polymer physics I.I.Perepechko

CS-251 ELEMENTS OF COMPUTER GRAPHICS

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction: Interactive Computer graphics, graphics hardware, input devices, output devices. Point Plotting

Techniques: Coordinate systems. Incremental methods. Line drawing algorithms, circle generators.

Two-Dimensional Transformations: Transformation principles, concatenation, matrix representation.

Clipping & Windowing:- Line clipping algorithm, Polygon clipping, viewing transformations, windowing transformation.

Graphics Package: Rules of Graphics software design, functions, Domains graphics primitives, windowing function, miscellaneous functions.

Three Dimensional Graphics: Representation of 30 shapes, curves and surfaces, removing hidden edges and surfaces sheding intensity and colour.

Raster Graphics: Raster Graphics fundamentals, solid area scarn conversion.

Computer Aided Design: Introduction, Applications, commercial CAD packages, autoCAD, drawing lines, text and numerals, moving and copying drawings, dimensioning.

Ref.Books

1) Newmann & Sproull Principles of Interactive Computer Graphics. McGraw- Hill.
2) James H.Earle Engineering Design Graphics.
3) Boker Computer Graphics.

ME-251 ELEMENTS OF MECHANICAL ENGINEERING

Internal Marks: 40	**L T P**
External Marks: 60	**3 1 0**
Total Marks : 100	

PART-A Kinematics And Dynamics of Machines

Mechanism: Kinematic quantities, concept and classification of links and pairs, kinematic chain ,Inversion of kinematic chain, degree of freedom; Mechanisms.

Motion Analysis of Mechanisms Absolute and relative motions and their vector representation, Instantaneous centre, Kennedy's theorem. Various methods of analysis for velocity and acceleration of mechanisms.

Cam Follower Mechanism Classification, Cams ,Types of motion curves and their analytical expression, graphical construction of Cam profiles for different types of followers, pressure angle and size. Transmission and Measurement of Power Belts-Types and application; Flat and V- belts, Power transmission in open and cross connection. Brakes and Dynamometers-Types, their construction and working. Gears:-Fundamentals of gear transmission, Law of gearing, tooth profiles, Standard tooth forms; Spur and helical gears ,gear trains.

Balancing Introduction, Static and dynamic balancing of rotating masses; Balancing machines.

PART-B APPLIED THERMODYNAMICS

Steam properties Steam formation, Steam tables, Temperature- entropy diagram, Mollier diagram, Expansion of steam, Throttling process, Measurement of dryness fraction.

Steam Generators Types of boilers, Boilers Mountings and Accessories, Lancashire, Babcock and Wilcox, Cochran and Locomotive boilers, Heat Balance.

Refrigeration Introduction, Simple Vapour compression cycle, Factors affecting the performance of vapour Compression refrigeration system, Ph diagram, Properties of common refrigerants, Absorption refrigeration system.

Elementary Heat Transfer Introduction to modes of Heat Transfer, Conduction, one dimensional steady state heat conduction through a plane and composite wall, Thermal resistance and conductance, Over all heat transfer coefficient.

Newton's Law, Mechanism of free and forced convection, dimension less parameters, Simple empirical relations, Radiation

Ref.Books:-

1. Beaven Theory of Machine
2. Khurmi & Gupta Theory of Machines.

TT - 207 Lab. I (TEXTILE FIBRE)

Internal Marks:	**30**	**L T P**
External Marks:	**20**	**0 0 2**
Total Marks	**: 50**	

At least 10 experiments are to be performed by each student

Physical and Chemical identification of following Textile fibre (s)

1) Identification of cotton
2) Identification of wool
3) Identification of silk
4) Identification of Bast fibres
5) Identification of polyester
6) Identification of nylon
7) Identification of Acrylic
8) Identification of Polypropylene
Identification of fibres in blend and % fibre content in blend
9) Analysis of P/C blended fabric
10) Analysis of P/V blended fabric
11) Analysis of P/W blended fabric
12) Estimation of fibre/filament fineness using projection microscope.
13) Determination of moisture regain and diameter of natural and synthetic fibres under different relative humidity (R.H.).
14) Effects of acids, alkalies and oxidising agents on natural and synthetic fibres.

TT - 209 Lab.II (Introduction of Textile Engineering)

Internal Marks: 30	**L T P**
External Marks: 20	**0 0 2**
Total Marks : 50	

At least 10 experiments are to be performed by each student

1. Preparation of lea & hank and calculation of fineness.
2. Calculation of count of yarn using different instruments.
3. Determination of twist.
4. To study the objects of different beaters/openers.
5. To study To study the working principle of trash analyser
6. To study the working principle & path of the material in a carding machine.
7. To study the working principle & path of the material in a drawing frame.
8. To study the working principle & path of the material in a roving frame.
9. To study the working principle & path of the material in a spinning frame.
10. To study the working principle & path of the material in a winding machine.
11. To study the working principle of conventional weaving machine.
12. To study the working principle of non-conventional weaving machine.
13. To study the working principle and yarn path of circular & flat knitting machine.
14. Study of all the processing machines.
15. Dyeing of fabic/yarn with direct dyes.
16. Study of different techniques of printing.

CS-253 Lab.III (ELEMENTS OF COMPUTER GRAPHICS)

Internal Marks: 30	**L T P**
External Marks: 20	**0 0 2**
Total Marks : 50	

At least 10 experiments are to be performed by each student.

1. Do two line segments intersect.
2. Compute the convex hull of a set of planar points.
3. Sean convert line segments.
4. Clip line segments against windows.
5. Fill polygon with stipple patterns.
6. Use phigs to show objects in various views. The truncated cube of Module 3 employed here.
7. Display the view volume.
8. Show a unit cube in perspective.
9. Implement the de Casteljau algorithm for curves.
10. Demonstrate the properties of the Bezier curves.
11. Run a sample session on Microsoft Windows including the use of Paintbrush.
12. Run a simple X session including the use of the xfig package.
13. Run a sample session on the Macintosh.
14. Compile and link sample Motif program.
15. Write a simple file browser.

ME - 253 Lab.IV (ELEMENTS OF MECHANICAL ENGINEERING)

Internal Marks: 30	**L T P**
External Marks: 20	**0 0 2**
Total Marks : 50	

At least 10 experiments are to be performed by each student

1. Study of various mechanisms; Slider Crank & their inversions, Four bar etc.
2. Study of various types of braks & dynomometers.
3. Study of various type of gears & gear trains.
4. Study of cam followers mechanisms.
5. Kinematic analysis of cam follower mechanisms.
6. Static & dynamic balancing of rotating masses.
7. Study of the moles of boilers such as:
   - **a.** Cochran
   - **b.** Locomotive
   - **c.** Babcock & Wilcox
8. To find C.O.P. of a refrigerator.
9. To find C.O.P. of water cooler.
10. To find coefficient of Thermal Conductivity of a metal rod.
11. To study the phenomenon of natural convection & find heat transfer.
12. To find heat transfer through forced convection.
13. To find heat transfer in parallel flow/counter flow heat exchanger.

TT-202 YARN MANUFACTURE - I

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Objects of ginning. Roller, saw and McCarthy ginning machines. Objects of mixing and blending. Different methods of mixing and blending. Study of modern blending machines, Auto mixer. Principle of opening and cleaning objects of Blow room line. Various type of opener and cleaner their construction and working. Study of Lap forming mechanism. Object and weighting arrangement of calendar rollers. Length measuring mechanism, feed regulating system. Single line processing, selection of machinery for different types of cotton fibre. Different types of Lap defects and their remedies. Cleaning efficiency of blow room line. Degree of opening. Calculations pertaining to Lint Loss, Production etc of blow room Line. Objects of carding. Introduction to roller and clearer card. Principle of carding. Detailed study of revolving flat card. Construction feature and working details of licker-in cylinder , doffer and flats. Card clothing; metallic & flexible, Carding angle, card setting, Neps in card, Fibre hooks, Fibre transfer. Features of high production card. Defects in card web & their remedies. Autoleveller Calculation pertaining to production, draft etc. of carding m/c.Automation and Recent development in Blow room and Card. Selection of Blow Room line for different types of cotton fibre. Material handling.

Objects of drawing. Principle of roller drafting. Detailed study of draw frame machine. Roller & Rollers settings, Roller weighting, Roller clearer, Mechanics of roller slip, roller eccentricity, roller vibration. Conventional drafting system, Shirley draft distribution. Drafting wave, Different drafting system, Features of Modern draw frame Autoleveller in drawframe.Calculation of draft & production of draw frame machine.

Recommended Books:-

Author	Title
1) W.Klein	Manual of Textile Technology Vol. I-III.
2) Venkatsubramanian	Spun Yarn Technology Vol-I,II
3) Textile Institute	Manual of Cotton Spinning
4) W.Tagert	Cotton Spinning
5) Salhotra K.R.	Spinning of Man-Made & its blend on Cotton system
6) S.Sazaloki	Opening, Cleaning & Carding
7) E.Oxtoby	Spun Yarn Technology

TT-204 Textile Fibre-II

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction to man-made fibres. Idea about fine structure of man-made fibres. Crystallinity, orientation and its effects on fibre properties. Melt Spinning with special reference to Polyester& Nylon. Melting of polymer chips, extrusion, spinning, drawing, heat setting & cutting of melt spun filaments/fibre.
Wet and dry spinning with special reference to acrylic.
Relative merits & demerits of the wet & dry spinning systems.
Preparation of polymer solution, extrusion, spinning, filament formation drawing, heat setting, cutting of wet & dry spun filaments/fibre.
Introduction about heat setting. Important

Ref.Books:-

Title	Author
1)Production of Synthetic fibres.	A.A.Vaidya
2)Man-made Fibre Sc.& Tech. Vol. I,II,III.	Mark, Atlas, Cernia
3)Fundamentals of fibre formation	A. Ziabicki
4) Man Made Fibres	R.W. Moncrieff
5) Textile Fibre to Fabric	Bernard P. Corbman

TT-206 FABRIC MANUFACTURE-I

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

WINDING: Objectives, basic features of slub catchers like Mechanical and electronics types, yarn tensioners: Additive multiplicative Anti patterning: Reasons and Remedies. Classification and basic features of auto winders like Autoconer, Barbar Colman spooler etc, yarn fault classifying system A to K.

PIRN WINDING: Objective, different types of pirns, yarn traversing system, automation, standard winding parameters.

WARPING: Comparison of various types of warping such as Beam warping & sectional warping, basic features, Creels, Reeds, Leasing systems and drawing systems.

SIZING: Objectives & classification of sizing methods, features of sizing machine, machine elements, sizing ingredients ,size preparation .Principles of different modern sizing techniques and their uses.

WEAVING: Manual, automation, General loom classifications, overall concept of looms. Primary, secondary & Auxiliary motions of looms.

CALCULATIONS ON: Production and efficiency related to winding, warping and sizing. Machine Balancing in winding, warping & sizing.

SHEDDING: Different types with advantages and disadvantages. Reed and reed counting systems. Tappet shedding: Mechanisms & principles. Positive & negative shedding. Heald reversing motions.

PICKING: Types such as under picking, over picking and parallel picking. Calculation of Picking force, shuttle velocity. Different picking accessories and its function. Pick timing such as late picking early Picking. Reasons of false picking & shuttle fly.

SLEY: Movement of sley, Beat-up, sley eccentricity, Calculation related to sley eccentricity & its effects.

Ref.Books:-

	Title	Author
1.	Textile Mathematics	J.E.Booth
2.	Weaving Mechanism	N.N. Bannerjee
3.	Winding	M. K. Talukdar
4.	Weaving calculations	A.Sengupta
5.	Principles of Weaving	Marks & Robinson
6.	Conversion of Yarn to	Lord & Mohammed

TT-208 TEXTILE CHEMICAL PROCESSING - I

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction to chemicals Processing of Textiles, objects of various Processes. Singeing : Its types details of each method & controlling parameters, limitations of each process. Change in property of Textiles after singeing.
Desizing : Type, method details, drawbacks and advantages of different methods, Role of different chemicals used, enzyme inactivation, checking of Desizing efficiency.
Scouring : mechanism of removal of dirt/dusts as well added and/or natural impurities. Details of method, saponification and emulsification. Scouring of colored textiles. Measurement of scouring efficiency.
Bleaching: Various methods, details of each method, combined scouring and bleaching, limitation and efficiency of various methods. Measurement and bleaching, limitation and efficiencies of various methods. Measurement of bleaching efficiency. Bleaching of blended textiles.
Mercerization: Change in structure of textiles, Process details, causticization NH3 Wet/Hot
mercerization. Efficiency of mercerization and its determination.
Heat Setting:- Mechanism of the process, various methods of heat setting, change in properties of textiles after heat-setting, Measurement of heat-setting efficiency. Carbonization :-
Object, method details, controlling parameters, drawbacks and advantages.
Textile Finishing :Physical and chemical finishing. Physical finishing methods viz, calendaring, Sanforizing, Softening, Creep finishing etc. Details of each methods and their objects. Terry-Wool finishing. Chemical finishing : Selection of catalyst, selection of chemical for various finishes like crease-resist finish, repellent finish. Details of
application, scope of application, Mechanism of change in properties of textile after resin finishing.

Problems associated with various resin finishing methods and measures to reduce these problems. Measurement of finishing efficiency.
Finishing Machines:-
Stenter, Sanforizer, Calendar, their construction and working principle.

Ref.Books

Sr. No.	Title	Author
1	Technology of Bleaching& Mercerization	V.A.Shenai
2	Textiles Auxiliaries& Finishing Chemicals	Vaidya
3	Handbook of Textile Finishing	A.J.Hall
4	Textile Finishing	V.A.Shenai
5	Carbonisation	ATIRA
6	Chemical technology in the Pretreatment processes of Textiles	Karmakar
7	Mercerizing	J.T.Marsh
8	An introduction to textile bleaching	J.T.Marsh
9	Introduction to textile chemistry	Bruce E Hartsuch
10	Textile science	J.T.Marsh

TT-210 Fabric Structure & Analysis

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Formation of fabric. Fabric cover and crimp. Detection of directions of warp and weft. Weaving plan. Methods of its preparation. Detailed study of various weaves for their reproduction: Plain weave & its derivatives, Twill weave & its derivatives. Satin/sateen weave & its derivatives. Diamond and diaper, Honeycomb, Huck-a-back, Mock leno. Welt/pique, Bedford cord, crepe weaves. Stripe & check effects. Its types. Different methods to produce these weaves. Color and weave effect. Terry weaves Backed fabric, Doubled fabric. Technical specification of important weaves. Calculation relating to raw material required to produce different weaves .

Ref. Books

Author	Title
Watson's	Textile Design & Color
Watson's	Advanced Textile Design
Nisbet	Grammer of Textile Design

IC-252 Elements of Instrumentation & Control Engineering

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction to different types of instruments, potentiometer, galvanometer,Ammeter,voltmeter,Tachometer. Definition, Classification of different types of Transducers.Construction & operation principle of Resistance transducer, Piezo electric transducer,photo voltaic. Introduction to different types of control technique.(open loop, closed loop), Mathematical modelling of Textile Processing, Chemical Process and mechanical process. Definition of Transfer function,reduction Techniques of T.F.,Signal flow graph.Time response of second order system, steady state error, stability of the system.

Ref.Books:

Author	Title
1) Richard C.Dorf	Modern control system.
2) B.C.Kuo	Automayic control system.
3) C.Johnson	Process control instrumentation technology.
4) A.K.Sawhney	Electricals & Electronics measurements.

TT - 212 Lab.V (Yarn Manufacture)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

1. Study of general outline of opener & clearer machine empolyed in B/R line process.
2. Study of following in shirley trash analyser machine.
   A) Chief organs.
   B) Gearing arrangements.
   C) Speed of different beater.
   D) Teeth inclination & Teeth per inch.
3. Determination of trash content and analysis of waste by using trash analyser machine.
4. Study of carding machine with technical details.
5. Study of gearing mechanism calculation of the speed of different organs of carding machine.
6. Calculation of draft between different zone & production of carding machine.
7. Study of card settings for different fibre lengths & types.
8. Maintenance and overhauling of carding machine.
9. Study of distribution of fibrous waste in a carding machine.
10. Study of the `NEP -COUNT' in a card.
11. Study of drafting arrangement & top roller weighting system of drawframe machine.
12. Calculation of the total draft and its distribution in draw frame machine.
13. Effects of break draft and roller settings on sliver uniformity.
14. Measurement of nip-load pressure, roller ecentricity & shore hardness of top roller drafting rollers.
15. Maintenance and overhauling of draw frame machine.

TT - 214 Lab.VI (Fabric Manufacture)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

1. Study of the motion transmission system in winding machine.

2. Study of the effect of slub catcher, yarn tensioner & yarn guide on package formation.

3. Study of Package stop motion in cone winding machine.

4. Calculation of winding speed on grooved drum winding system and study of antipatterning system incorporated to it.

5. Study of precision winding machine and mechanism of package building.

6. Study of the motion transmission system in Pirn winding machine.

7. Calculation of winding speed and traversing speed of Pirn winding machine.

8. Study of the sectional working machine & plan the width of a section according to the given striped fabric keeping in view the pattern.
9. To study the passage of yarn on a sizing machine and the features of various parts/mechanism of the sizing machine.
10. To Select the proper reed and heald for a weaver's beam keeping in mind the beam, loom size and fabric construction.

11. Study of shedding mechanism of shuttle loom and cam positioning with respect to loom cycle.
12. Study of picking mechanism. Picker movement in relation with crank shaft rotation & calcualtion of average velocity of shuttle.
13. Study of sley movement,construction and calculation of sley eccentricity.

TT - 216 Lab.VII (Textile Chemical Processing)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

1. Scouring of cotton goods
2. Scouring of polyster goods
3. Scouring of P/C blended goods
4. Scouring of wool fibre
5. Degumming of silk
6. Bleaching of with H_2O_2 of cotton
7. Bleaching with $NaClO_2$ of cotton
8. Bleaching with NaOCl of cotton
9. Bleaching of Polyester
10. Bleaching of P/C blend
11. Bleaching of jute yarns/fabric
12. To dye the fabric with direct dye & its after treatment
13. To dye the fabric with reactive dyes
14. To dye the fabric with Azoic dyes

TT - 218 Lab.VIII (FABRIC STRUCTURE & ANALYSIS)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

Analysis of different fabric samples to know their particulars as stated:-

For Yarns:-

Ends & Picks/inch

Warp & Weft Count & Crimp

Warp & Weft Crimp

Ply & Twist.

For Fabrics:-

Tape length,Reed width, Denting order,Weight of warp & Weft & fabrics, Weight per square yard,Warp & weft cover, Colour plan, and use.

Study of the following fabrics samples:-

1. Plain & derivatives
2. Twill & derivatives
3. Diamonds & Drapers
4. Honey comb
5. Huck-a-back
6. Mockleno
7. Welts & Piques
8. Stripe & Cheques
9. Satin / Sateen
10. Crepe
11. Terry pile
12. Colour & Weave effect.
13. Double Cloth

TT-301 PROPERTIES OF FIBERS.

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Traditional view of fibre structure. Basic concept of the methods of investigation of fibre structure, e.g, x-ray diffraction electron microscopy, I.R absorption. Fibre density and measurement of moisture absorption, measurement of regain, relationship between M.R,M.C & humidity. Heat of sorption measurement and its effect. Quantitative theory of moisture absorption. Hystersis of moisture absorption. Tensile properties, Factors determining the result of tensile tests. Quantities & units of different parameters. Experimental methods. Fibre fracture, Effect of variability weak link effect specimen length, strength. Elastic recovery: Definition, experimental methods, change of properties as a result of straining. Time effect; study of time dependence. Definition of elastic inelastic, viscoelastic & plastic deformation creep, relaxation of stresses ,time & tensile testing. Introduction to dynamic testing & fatigue Concept of models; Kelvin & Maxwell model. Elementary concept measurement of bending & torsional rigidity of fibre. Structural effect on extension behaviour of rayon, wool & cotton fibre. Fibre friction its measurement, nature of friction & equations. Friction of fibre. Thermal properties & setting. Optical properties refractive index fibre birefringence orientation, Dichroism. Introduction to dielectric property & static electricity of textile material.

Ref.Books:-

Title	Author
1) Properties of fibres	Morton & Hearle
2) Physical Properties of Polymers	A.Tager

TT-303 YARN MANUFACTURE - II

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Principles and techniques of preparing material for combing, combing cycle of different combers, recent developments in combers, the effect of machine setting and timings on product quality, quality control in combing, norms and calculations. Functions and synchronization of various mechanisms concerned with roving production, Latest improvement in the design of speedframe, norms calculations, improvements in areas to control roving quality, performance assessment.

Function and mode of operation in ringframe, design features of the machine, yarn guiding devices, cop building, spinning geometry, design of rings and travellers, combination effects, high speed ring and travellers, angle of yarn pull, forces acting on yarn during twisting and winding, fibre lubrication, causes of end breakage during spinning latest developments in ringframe, calculations, norms, quality control to improve the yarn characteristics.
Introduction to nonconventional spinning technologies like
open end, Airjet, friction etc.(Manufacturing technique, chief
organs, yarn structures & properties).

Ref.Books

	Title	Author
1.	Spun yarn Technology	Venkatsubramani
2.	Manual of Textile Technology Vol.1 - 6.	W.Klein
3.	Essential Elements of Tech.	T.K.Pattabhiram

TT-305 FABRIC MANUFACTURE - II

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

LET OFF:- Different types of let-off systems, long term, short term and medium term variations. Relation between beam diameter and tension of warp. Principles of modern positive Let-off systems as such as Sulzer, Hunt, etc.
TAKE-UP:- Types of take-up, examples of each, periodicity, Modern continuous take up like Sulzer, Saurer etc.
WARP STOP:- Types of warp stop motions with examples such as Mechanical & Electrical stop motion.
WARP PROTECTOR:- Loose reed and fast reed warp protector motion.
WEFT STOP:- Weft feelers and its different types.
DOBBY:- Object of dobby, scope of dobby, different types of dobby and their mechanism such as Positive and negative dobby. Pegging systems as per design of fabric. Paper dobby-climax dobby.
JACQUARD:- Scope of jacquard, different types of jacquard such as single lift single cylinder, Double lift single cylinder, double lift double cylinder, cross border jacquard, Jacquard card punching systems as per fabric design.
Temple motions and its importance. Different types of temples used in loom.
Automatic Package Changing mechanism (Pirn changing and shuttle changing).
Importance of Multiple Box motion.(2x1 and 4x1 drop box)
Different types of non-conventional weaving machines. History behind their development Sulzer projectile weaving machines (Shedding, beat-up, torsion bar picking, let-off and Take-up mechanism).Projectile checking and return.
Air-Jet and water Jet weaving machine. Elitex and Sulzer airjet weaving machine. Picking System of water jet weaving machine.
Different types of Rapier weaving machines. Weft feeding system to the shuttleless weaving machines.
Multiphase weaving basic principle. Circular weaving machine.

Ref.Books:-

Author	Title
1. Marks & Robbinsons	Principles of weaving
2. Talavashek & Svaty	Shuttle less weaving
3. Banerjee, N.N.,	Weaving Mechanism - II
4. Lord,P.R.& Mohamod,L.	Weaving:Conversion of yarn to fabric.

TT-307 Textile Chemical Processing-II

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Coloration of Textiles: - Types coloring Materials additive and subtractive theory of colour, tristimulus values of Colour, metamerism/isomerism. Blindness of color. Theory of Dyeing: - Application of various dyes, dye-fibre interaction.
Dyeing of Textiles: - Dyeing of individual fibers with various Dyes in different forms, viz Dyeing of celluloses with Direct Reactive, vat, Insoluble aroic, sulphur, Indigosol. Oxidation, Phthalocyanine and Mineral colors; Dyeing of protein fibers With acid, basic, metal complex dyes, Dyeing of Polyester with Disperse dyes, nylon with disperse/metal complex, direct Dyes, Dyeing do PAN with Basic, disperse dyes; dyeing with Pigments. Auxiliaries used in dyeing. Dyeing of Blend :Production of various types of shades on blended textiles, one Bath one step/two step and two bath two step dyeing of Various blends. Machineries used in Pretreatments and Dyeing of textiles: Singeing machines- Box, Kier, Mercerisation m/c, Jigger, winch, Jet/HTHP beam dyeing M/cs, Polymeriser, Padding mangle, loose fiber dyeing m/c Package dyeing m/cuss. Identification of dyes:- Identification of dyes While on textiles viz, cellulosics, protein and manmade fibres.
Methods of Printing: - Hand block Machine, block, roller and Screen-printing methods. Advantages and drawbacks of all These printing methods.
Styles of Printing: - Direct, Discharge And Resist styles on cellulosic, Protein, manmade textiles and Their blends. Printing Paste: Constituents of print paste. Thickener and Its types. Function of thickener. Selection of thickener. After treatments: - Steaming, curing, ageing of Prints. Transfer Printing: - Various methods of Transfer Printing, selection a paper and dye. Mechanism of various Transfer printing methods. Limitations and advantages of Transfer printing.

Ref.Books

S.No.	Title	Author
1	Textile Printing	L.W.C.Miles
2	Textile Printing	V.A.Shenai
3	Dyeing of Synthetic & Acetate Fibers	D.M.Nunn
4	Cotton piece dyeing	ATIRA
5	Dyeing of Polyester & Cellulose Blends	ATIRA
6	Technology of Dyeing	V.A.Shenai
7	The Dyeing Of Textile Materials	Jose Cegarra
8	Dyeing and chemical technology of TextileFibre	E.R.Trotman

TT-309 TEXTILE TESTING

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction to testing, the selection of samples for testing: Sampling techniques, sample size and sampling errors. Moisture content & regain, standard atmospheric conditions, correction of yarn count and strength for humidity changes, principles of moisture measuring instruments, measurement of fibre length by Baer sorter and fibrograph instrument. Measurement of fibre fineness, maturity, crimp, strength and trash content.
Measurement of yarn count, twist, hairiness, type of faults in yarns. Yarn Evenness and imperfections testing of slivers, rovings, and yarns, spectogram analysis, testing of textured yarns for crimp contraction
and crimp stability.
Principles of measuring fabric properties like thickness, compressibility, air permeability bending rigidity, crease recovery, pilling, drape, tear strength, bursting strength and abrasion resistance. Application of statistical techniques like control charts, correlation analysis, significance tests, frequency distribution and analysis of variance in quality control.

Ref.Books

	Title	Author
1.	Textile Testing	J.E.Booth
2.	Textile Testing Vol.1,11	Augappan
3.	Physical Testing of Textiles.	Saville

HUM-301 INTRODUCTION TO ENGG. ECONOMICS AND MANAGEMENT

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

INTRODUCTION TO ENGG. ECONOMICS
Importance of Economics for Engineers. Macro & Micro Economics. Various definitions and Concepts of terms used such as Economic goods, Utility, Value, Price Structure and Profit, Capital, Money, Income, Margin.

HUMAN WANTS:
Consumption and Standards of Living. Consumer Behaviour, Consumers surplus. Law of Demand, Demand Curve, Elasticity of Demand, Law of Substitution, Demand Analysis, Demand Forecasting. Supply, Supply Curves. Markets & Markets forms: Equilibrium of firms & Industry.

PRICING:
Commodity pricing under perfect competition. Equilibrium of demands and supply. Price under imperfect competition. Theories of Distribution: Wages, Rent, Interest, Profits.

COSTING:
Various Elements contributing to Cost of Production such as Prime Cost, Factory Cost, Total Cost, Fixed and variable Costs, Allocation of Overhead Costs, Selling Price, Break Even Analysis, Break Even Chart. Depreciation, Causes of Depreciation, Methods of Depreciation.

INTRODUCTION TO MANAGEMENT:
Importance of Management, Managerial Functions, Principles & Levels of Management.

ROLE OF A MANAGER:
Tasks of a Professional Manager, Responsibility of Professional Manager, Managerial Skills, Functions and Authorities of A Manager, The Manager and the Environment.

DECISION MAKING AND COORDINATION:
Various Definitions related with Decision Making, Decision Making Process, types of Decisions, Techniques of decision Making, Coordination, Various definitions, its importance & its various techniques, Vertical and Horizontal coordination in an Organization.

RECOMMENDED BOOKS:

Paul, A. Samuelson	Economics(McGraw-Hill)
R.L. Varshney & K.L. Mahesh wary	Managerial Economics(Sultan Chand)
O.P. Khanna	Industrial Engg. & Management(Dhanpat Rai & Sons)
A. Barathwal	Business Economics(Vikas Publishing House)
Gupta, Sharma, Bhalla	Principles and Practice of Management(Kalyani Publisher)

TT-311 Lab.IX (YARN MANUFACTURE)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

1.To study the timing diagram of a comber.

2.To study the function of top comb and its depth of penetration with reference to noil extraction and fractionating efficiency.
3.To study the nature of movement of nipper assembly.
4.To study the mechanism of detacting roller drivee and the nature of its motion.
5.To study the effect of type of feed and detachment setting on noil percentage and fractionating efficiency.
6.To estimate head to head difference in noil level (mill based study).
7.To study the effect of feed per nip on percentage in nep level during combing.
8.To study the Drafting, Twisting and Winding Zone of speed frame.
9.To study the Gearing & Driving mechanism of speed frame.
10.To study the Differential Motion of speed frame and calculation of Bobbin speed.
11.Calculation of break draft constant,draft constant and twist constant and production of speed frame.
12.To study the influence of machine and process parameters on roving unevenness.
13.To study the drafting,twisting and winding zone in ring frame.
14.To study the Gearing, Driving and Building motion in ring frame.
15.Calculation of Draft Constants, Twist Constant,Coils per inch and production of ring frame.
16.To ascertain the effect of break draft and total draft on yarn unevenness and strength.
17.Estimation of spinning tension as a function of traveller weight,yarn count and balloon height.
18.To perform various settings and maintenance operation on ring frame.Such as:
Ring rail levelling
Spindle gauging
Spindle eccentricity
Lappet eccentricity
19.To study the effect of shore hardness on yarn quality.
20.To study the influence of spindle speed & traveller weight on hairiness.
21.Study the chief organs,mechanism and calculations of open end and friction spinning machines.

TT-313 Lab.X (Fabric Manufacture)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

1. Study of take up motion and calculation of loom take up constant.
2. Study of positive let-off system.
3. Study of Warp protection motion (both loose reed and fast reed).
4. Study of warp stop motion.
5. Study of Beating up system in Tery towel loom.
6. Study of Jacquard machine and designing of cards for different weave designs.
7. Study of temple motions.
8. Study of pirn changing mechanism.
9. Study of side/centre weft fork mechanism.
10. Study of (4x1) multiple box motion.
11. Study of Let-off and take-up of shuttless weaving machine.
12. Study of weft insertion mechansim of Air-jet and rapier weaving machine.
13. Study of selvedge formation technique of Air-jet weaving machine.
14. Identification of fabric faults by fabric inspection machine.

TT-315 Lab.XI TEXTILE CHEMICAL PROCESSING-II)

Internal Marks: 30	**L T P**
External Marks: 20	**0 0 2**
Total Marks : 50	

At least 10 experiments are to be performed by each student

1. To dye fabric with Sulphur dyes

2. To dye fabric with Vat dyes

3. To dye fabric with Indigoid dyes

4. To dye wool fibre with:
   a) Reactive dyes
   b) Acid mordant dyes
   c) Metal complex dyes

5. To dye silk with acid dyes or acid mordant dyes

6. To dye PET with disperse dyes

7. To dye nylon with acid dyes, metal complex dye

8. To dye acrylic with basic dyes

9. To print the cotton fabric with hand block method with direct style

10 To print the cotton fabric with hand block with discharge style

11. To print the cotton fabric with hand block with resist style

12. Study of fastness properties of different dyed samples

13. Identification of dyes on dyed fibres or fabrics

14. To finish the fabric with:

   a) Water repelling agent
   b) Urea formaldehyde

TT-317 Lab.XII (TEXTILE TESTING)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 15 experiments are to be performed by each student

1. To prepare a Bear Sorter diagram and determine the following:
   (i) Mean Length
   (ii) Effective length
   (iii) short fibres Percentage
   (iv) Dispersion Percentage
2. Determine 2.5 % S.L.,50 % S.L., uniformity ratio of a given cotton using fibro graph. construct a fibrogram by re-setting the counters for various S.L. between 5 % to 90 %. Compare the fibrogram of manmade fibre with cotton.
3. Determine the micronaire value of a given cotton sample by Air-Flow method. Convert the result into SI units and give a suitable rating to the fibre sample .
4. Determine maturity coefficent and maturity ratio of a given sample by caustic soda method.Give appropriate rating to the fibre sample.
5. Determine pressley Index of a cotton sample by pressley Tester at zero and 3mm gauge length and convert result into tenacity. Compare & comment on the results at different gauge lengths.
6. Determine the bindle strength and elongation of a given manmade fibre using stelometer.Study the effect of rate of loading on tensile properties of the fibre.
7. Determine moisture content/regain of a fibre sample by hot air oven method.
8. Determine Crimp (arcs/cm and crimp %) of a given manmade fibre sample.
9. Determine fibre fineness of a manmade fibres/filaments by:
   * whole fibre method
   * vibroscope
10. Tensile properties of a staple fibre by:
    * vibromat
    * Instron/zwick UTM
11. Determine stress relaxation and creep recovery of fibre.
12. Study evenness and imperfection in the given yarn and compare the results with uster statistics. Study the spectrogram and irregularity trace to determine type of irregularity present. Study the imperfections at different senstivity level for different yarn samples.
13. Prepare yarns Appearance Boards and compare with ASTM standards.
14. Study the hairness of a given yarns using Hariness Tester. Compare the results of Evenness Tester and Hairness Tester with ASTM grade.
15. Determine coefficient of friction of a spun yarn and see the effect of waxing on coefficient of friction.
16. Determine bending rigidity by (HEART) loop method.
17. Determine the Lea C.S.P by Lea CSP Tester and Autosorter and compare the results.
18. Determine the percentage crimp and corrected count with the help of crimp Tester.
19. Determine the crimp rigidity by using hot crimp contraction method.
20. Characterise a woven fabric with respect to its dimensional

properties.
- thread density
- yarn number
- yarn crimp
- weave
- cover factor
- areal density
- skeaness
- thickness

21.Determine the tensile strength and enlongation of a woven fabric and compare the Load-elongation curve with Non-woven and knitted fabric.
22.Determine the tear resistance of a fabric using Elmendopf Tear Tester.
23.Determine the bursting strength of a fabric on a hydraulic bursting tester.
24.Determine the abrasion resistance and pilling resistance of a fabric.
25.Determine the crease recovery of fabric and observe effect of loading time & recovery time on crease recovery.
26.Determine the Drape coefficient of a fabric sample.
27.Determine the compressional property of a fabric (thickness).
28.Determine the Air permeability,water permeability and water repellency of a fabric.
29.Determine the thermal resistance of a fabric.
30.Determine the stiffness of a fabric.
31.Fibre Testing by HVI
32.Classimat fault analysis (yarn fault classifying system)
33.Spectrogram analysis for spun yarn
34.Knittability of hosiery yarn

TT-401 THEORY OF TEXTILE STRUCTURE

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Types of yarn, Interrelation of fibre, yarn and fabric structure and properties. Basic geometry of Twisted yarns; The idealized helical yarn structure, yarn count and twist factor, Limit of twist contraction and retraction; Theoretical calculations. Real and idealized yarns. Packing of fibres in yarn. Idealized packing; open packing, hexagonal packing, Deviations from idea forms; Concentrating features, disturbing features; Packing in actual yarns, specific volume of yarns, Relation between twist, Diameter and Twist angle. Fibre Migration: Ideal migration, Parameters affecting migration observation of the paths of Individual fibres, Characterization of migration behavior, Tension variation as a mechanism of migration; Criteria for interchange of position, Migration in plied structure, Theory of migration; Conditions for migration to occur.

The form of yarn twisting; Cylindrical and ribbon twisting, Geometric explanation of fibre migration. The combination of the mechanics of migration variation of fibre extension under small load. Analysis of tensile forces of yarn under stress and interrelation between modulus & fibre modulus yarn interrelation between yarn modulus & fibre modulus. Prediction of breakage, Nature of rupture for continuous filament yarn. Observed extension & breakage of spun yarn; Traditional view, modified approach by Hearle & El-Sheikh, Kemp and Owen theory. Blended yarn structure blend irregularity, Humburger's Theory.

Engineering approach to the analysis of fabric, Pierce geometrical model of fabric, crimp interchange, relationship between h,p,c. Jammed structure, concept of similar cloth. Maximum possible cover factor and minimum possible pick spacing. Race track geometry, close limit of weaving. Pierce elastic thread model.

An elementary idea about tensile, bending, shear and drape behaviour of fabric.
An elementary idea about fabric objective measurement technology. Geometry of plain knitted fabric, different relaxation process of knitted fabric.

Ref.Books:-

Title	Author
1) Structural Mechannics of Fibres yarns & fabrics	Hearle,Grosberg & Backer.
2) Textile Yarns	Goswami,Martindale & Scardino
3) Cloth Geometry	F.T Pierce.

TT-403 PROCESS CONTROL IN SPINNING

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Considerations in evolving a system for Process Control: Control of mixing quality and Cost: Quality control through fibre characteristics, contol of mixing cost and quality, formulation of L.P.expressions: Bale Management. Control of yarn realisation: records for estimating yarn realisation and waste,norms for yarn realisation: Control of waste and cleaning in blowroom and cards: determination of trash content and cleaning efficiency, some important findings,norms for waste and cleaning, locating and improving the machines performance, optimising cleaning at cards,some recent findings: Control of Comber Waste: Control of yarn quality: unevenness and imperfections, count, strength and imperfections, count, strength and their variability: Yarn faults and package defects: Slubs, crackers, spinner`s doubles, bad piecings and double gaitings, slough off, hairiness: Machinery audit: Measurement and analysis of productivity: Means to improve productivity: Control of store expenditure: Implementation of process control in cotton spinning: Computations involved in the measurement and analysis of productivity: Collecting and analysing data on end breaks over a doff, Computation of within and between bobbin lea count variation : Statistical basis for calculating the number of wrappings and tolerance limits. Total Quality Control.

Ref.Books;

Title	Author
Process Control in Spinning	ATIRA
Spinning of Man-made & Their Blends in Cotton system	K.R.Salhotra
Process control in spinning :	R.Chatopadhaya I.I.T Delhi
Quality Control in spinning :	SITRA

TT-405 KNITTING TECHNOLOGY

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Knitting, Basic warp and weft knitting. Difference between warp and weft knitting. Classification of knitting machine and their application. Types and specifications of needles. Basic knitting action ; Beard, Latch and compound needle with sinkers. Different stitches : knit, tuck and float. Cam system, Machine and mechanism for producing basic structures viz-plain, Rib. Interlock and purl and its derivatives.

Properties and uses of different types of weft knitted fabrics. Four cam track system, Introduction to patterning in circular knitting machine, Pattern wheel, Pattern drum and punch tape pattern mechanism.

V-bed knitting machine and its cam system.

Electronic needle selection. Computer controlled knitting machine.

Warp knitting: Tricot and Raschel knitting machine. Loop formation process, design and properties of different warp knitted fabrics. Study of Let-off and take-up mechanism. Uses of warp knitted fabrics.

Concept of loop length and knitting tension, yarn feeding system, stop motion and tensioning devices. Comparison of knitted and woven fabrics. Production calculations of knitting machines.

Recommended Books:-

	Author	TiTle
1)	D.J.Spencer	Knitting Technology
2)	H.Wignal	Hosiery Technology
3)	T.D.Brown	Wool in Double Jersey

TT-407 QUALITY CONTROL IN TEXTILE INDUSTRY (QCTI)

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Concept of Quality Control, Economics of Quality Control, Organisation for quality, concept of Total Quality Management, Concept of Quality Circle & modern approach towards Quality.Statistics in Quality Control: Use and formation of Frequency distribution, histogram & frequency polygon, Importance of Relative frequency in Textile Mills, Different Standard Probability distribution & their uses in Textile Mills such as Geometric, Binomial, Poisson and normal Distribution. Concept & use of standard normal Distributions, Problems on standard normal Distribution, Basic idea of Significance Tests & Significance level and its application in Textile Mill.Corelation and Regression of variables and its use with problems.S.Q.C and different types of sampling system used in Textile Mills,different types of control charts in X,R,P & C and use of these in Textile Mills, Problems related control charts. Definitions & basic idea about OC curve AQL, AOQL, LTPD, Producers risk customers risk, AOQ, ASN. Idea about sampling Inspection and its use in Textile Mills.
WORK STUDY:- Basic idea of work-study in Method study & Time study. Flow charts with symbols, calculation of standard Time, Different method of Time study, Important terms & definition related to method study and Time study. It's applications in Textile Mills.

Ref.Books

Title	Author
1. Process Control in Weaving	ATIRA
2. Process Control in Spinning	ATIRA
3. Quality Control in Textile Industry	G.A.V.LEAF
4. Total Quality Control	Fiegenbaum

TT-409 NON-WOVEN TECHNOLOGY

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

INTRODUCTION TO NONWOVENS, CLASSIFICATION OF NON-WOVEN FABRICS. RAW MATERIAL - FIBRE - NATURAL, SYNTHETIC , VARIOUS INDUSTRIALLY PRODUCED FIBRES. WEB FORMATION: DRY-LAID NONWOVENS FROM STAPLE FIBERS, WET LAID NONWOVENS, MELT BLOWN TECHNOLOGY, SPUNBOND TECHNOLOGY. NEEDLE PUNCHED NONWOVENS, DEVELOPMENTS IN NEEDLE PUNCHING MACHINE.SPUNLACE(HYDROENTANGLEMENT TECHNOLOGY) THERMAL BONDING OF NONWOVEN FABRICS, CHEMICAL BONDING OF NONWOVEN FABRIC: VARIOUS TYPES OF BINDER, THEIR PROPERTIES AND FORMULATIONS, VARIOUS BONDING TECHNIQUES. FINISHING OF NONWOVEN BONDED FABRICS, STITCH BONDING, END USES OF NON-WOVEN FABRIC

Reference Books

Sl. No.	Title	Author
1	Non-woven bonded fabrics	Lunnenschloss
2	Nonwovens	N.N.Banerjee
3	Nonwovens	BTRA
4	Manual of Nonwovens	R. Kroma
5	Needle Punching	A.T.Purdy
6	Nonwovens	Gulrajani
7	Thermal bonding of Nonwoven fabrics	S.K. Batra

TT-415 MULTI-FIBRE PROCESS.

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Survey of established practices for the spinning of man- made fibres using different spinning system with emphashis on fibre and yarn properties and involving engineering principle. Purpose of blending of manmade fibres. Selection of fibre specifications for blending. Measures of blend intimacy. Effect of blend composition & fibre characteristics on properties of blended yarn. Blend mechanics. Advantages & disadvantages of different blending technique. Tinting for a blend. Processing of short & long staple manmade fibres on cotton system of spinnning. Spinning of dyed fibres. Spinning of manmade fibres on rotor spinning system.
Processing of long fibres on worsted/woolen system of spinning. Silk reeling. Introduction to twisting & spinning of silk fibres. Introduction to Jute spinning. Jute blending. End uses of jute and jute blended yarn & fabrics.

Recommended Books:-

	Author	Title
1)	Salhotra K.R	Spg.of Man-Made & its blend on cotton system.
2)	R.R.Atkinson	Jute Spinning
3)	Ya.Lipenkov	Wool Spinning Vol.-I,II.
4)	F.A.O	Manual of Silk Reeling & spinning
5)	Central Silk Board Bulletins.	Silk Reeling & Spinning Bangalore

TT-417 POST SPINNING OPERATIONS

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Object of post spinning operations. Stretching or drawing,drawing conditions, phenomenon of necking. Influences of drawing conditions on the structure and properties of fibres. Machines for stretching continuous filament yarn. Draw warping.
Stretching of polyester & acrylic tow. Draw warping.
Drawing of tow for production of staple fibre. Preliminary heat setting, crimping, drying and final heat setting, cutting & packing of staple fibres. Heat setting, object of heat setting. Different parameters which influence the heat setting process properties of fibre e.g time temperature & tension. Heat setting conditions for polyester polyamide, acrylic and polypropylene.
Introduction to texturing. Different methods for texturing factors influencing properties of false twist, draw textured,& airjet, textured yarns.

Recomended Books:-

Title	Author
1)Production of Synthetic fibres	A.A.Vaidya
2)Texturing	MANTRA
3)Man-Made Fibre Sc.& Tech. Vol.I,II,III.	Marks,Atlas,Cernia
4)Recent Advances in fibre Science	Ed.Mukherjee

TT-419 ADVANCED DYEING AND PRINTING TECHNOLOGY

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Thermodynamic study of different dyeing methods : Kinetic study of each dyeing method viz. dyeing of cellulosies with vat and reactive dyes of Pet with disperse dye,of nylon with metal complex dyes nature of dye-fibre bonds,Half time dyeing and its importance.
Theory of Coloureation of Textiles : Basic theories obeyed by specific dyeing methods,Migration of dyes,mechanism of dye-fibre attachment,Impact on dye-uptake percent due to modification of fibre sturcture,WLF equation.
Role of fibre structure in dyeing: Importance of orientation of fibre structure;shape,size and free volume vs.dye uptake,electrical property and ion formation capacity of fibres. Other parameters like swelling of fibre,pA,electrical property of dye to effect improved dye up-take percent. Drawing and Heat, setting of manmade fibres vs.dye uptake.
Modern techniques of dyeing : Rapid and imerse Rapid dyeing techniques. Solvent dyeing, foam dyeing and printing, spray dyeing.
Printing: Contituents of print paste,role of chemical used in print paste,selection of thickener for printing. Use of aqueous thickener in pigment printing,jet printing,Flexographic printing. Detailed study of discharge and resist styles of printing.
Recent developments: Recent developments in dyeing and printing technologies and Design of machineries. Detailed study of Transfer Printing.Various techniques to reduce cost of product and reduction in wastage of energy. Environment Pollution: Textile industry vs.environment,sources of air, water and various other pollutions inside textile units. Measurement of water-pollution, various methods to reduce waste-water load.

Ref.Books

Title	Author
1) Water & effluent in Textile Mills	ATIRA
2) Production of Synthetic fibres	V.A.Vaidya
3) Basic waste water treatment	Smethwest

TT-411 HUMAN RESOURCE MANAGEMENT

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction: Nature, Scope, development and operative functions of Human resource Management. Importance , role and position of Personnel function in the Organization.

The Planning Function: Manpower Planning & Career Development Planning. Job Analysis including Job Descriptions and Job Specifications.

The Procurement Function: The Recruitment & Selection, Induction & Placement. Employment Exchanges(Compulsory Notification of Vacancies) Act 1959. The Contract Labor(Regulation & Abolition) Act 1970. The Appraisal Function & Performance Appraisal.

The Development Function: Training & Development in Organization. Advancement/Promotions & Transfers. Apprentice Act-1961.

The Compensation function: Fringe & Retirement/Terminal Benefits. Administration of Welfare, Amenities. Safety and Accident Prevention. Factory act 1948. Shops and Commercial Establishments Act. Employed P.F. Act 1952 Scheme and Family Pension Scheme. ESI Act 1948. Workmen' s Gratuity Act 1972. Maternity Benefit Act 1961.

The Integration Function: Administration of suggestion Schemes. Employee Grievances and their redresses, Administration of Discipline. Employee Moral & motivation. Communication in Organization. Absenteeism. Labor Turnover. Changing face of the Indian Workforce and their environment.

Industrial Relations: Management-union Relations. Trade Union Movement. Collective Bargaining. Employees Participation in Management. Group dynamics: Nature of Work groups, group cohesiveness, group performance, group notes.

Suggested Books:

1. Personnel management :Edwin B. Flipps
2. Personnel Administration :Eigors P. & Myers.
3. Personnel and The Human Problems of Management :Strauss G. & Sayas I.R.
4. personnel Principles and Policies : Yader D.

TT-413 Lab.XIII (KNITTING TECHNOLOGY)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
Total Marks : 50

At least 10 experiments are to be performed by each student

List of Experiments.
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1. To study the path of yarn through plain knitting machine.

2. To study the different knitting elements including the cam system.

3. To study the driving mechanism of plain knitting m/c.

4. To study the cloth take-up mechanism of plain knitting m/c.

5. To study the rib knitting m/c including arrangement of dial and cylinder needles,cam system and driving mechanism.

6. To study the Interlock knitting m/c including arrangement of dial and cylinder needls,cam system & driving mechanism.

7. To study cam system of V - bed rib knitting m/c.

8. To study driving mechanism of V - bed rib knitting m/c.

9. Preparation of Fabric sample(rib, circular, half cardigan and full cardigan) in V-bed rib knitting machine.

10. To study the effect on loop length with the change in cam setting in flat knitting machine.

11. To study the effect of variation in yarn input tension on the loop length in V-bed rib flat knitting machine.

12. To study plain, rib and Interlock knitted fabrics (course per inch,wales per inch,loop length etc.)

TT-402 Mechanics of Textile Processes.

Internal Marks: 40	**L T P**
External Marks: 60	**3 1 0**
Total Marks : 100	

Forces acting on fibre during opening and cleaning processes. Analysis of piano feed regulating motion. Design of Cone drums for Scutcher. Evaluation of Blow Room performance. Mechanics of fibre entanglement and hook formation during carding. Degree of combing in carding process. Theories of carding. Forces acting in carding zone. Analysis of flat actions; opening, cleaning accumulation of flat strip on stationary flat. Carding Index. Transfer mechanism of fibres, Doffing arc, Analysis of its significance. Analysis of stripping process. Cylinder load and transfer efficiency. Configuration and estimation of degree of disorder. Effect of different parameters on hook formation, Fibre straightening & hook removal in roller drafting. Vasilieff's theory of Drafting. Mechanism of package building and twisting in speed frame. Design of Cone drums for roving frame. Differential gearing in Roving frame. Fibre fractionation in Comber. Balloon theory in spinning. Analysis of forces in yarn & traveller. Analysis of yarn tension during unwinding. Kinematics of sley and heald motion. Shed depth diagram. Shedding cam design. Mathematical treatment of picking. Friction and impactal checking with swell. Theoretical understanding of course of pick variation by beat-up force, Bumping condition. Forces acting at a floating back-roller w.r.t. Let-off.

Ref.Books:-

	Title	Author
1)	Textile Mathematics	J.E.Booth
2)	Carding	R. Chattopadhya
3)	Shuttless Weaving	Marks & Robinson.

TT-404 MILL MANAGEMENT,LAY-OUT & COSTING

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Mill location and site selection, different types of building for Textile Mills, Air conditioning and humidification in Textile Mills, different measurements of underground duct for air-conditioning, calculations of total heat, air circulation required etc.
Different terms and definitions like Dry bulb Temp, Wet bulb temp. humidity ratio etc. Basic Concept about Psychometric chart, different humidification systems used in Textile Mills.
Different types of Noise, primary idea about dB and different standards of it for different departments, Different remedial measures to minimize noise of different department.
Lights, different basic terms related to lighting calculations, different lamp shades and its uses. Concept of room index, concept of height and distance ratio related to lighting, calculations on lamp numbers and positioning depending on required illumination level etc.
Working environment, different measures of good working environment.
Material handling, types, advantages, different terms related to it, ways to reduce material handling expenditure.
Technique for spinning lay-out plan, fixing the number & capacity of lay-out for different count spinning process.
Weaving layout plan, layout and number of machines required for different fabric manufacturing.
Machinery balancing of chemical processing for different treatment processes of yarn and fabric.

Expression for cotton cost with illustrative example, Mixing cost/kg of yarn, Method of selection of cotton to minimize Mixing cost yarn selling price, Production per spindle. Impact on cost of spinning finer count and coarser count with Nominal count. End breaks in Ring spinning, how it affects the work assignment & cost, saving from higher assignment, cost of an End break.

Ref.Books :-

Title	Author
a) Textile Management	Dr.V.D.Dudeja
b) Project Management	A.Ormerod
C) Process Control in Weaving	ATIRA
d) Process Control in Spinning	ATIRA
e) Industrial Engg.and Management	O.P. Khanna

TT-408 TEXTURING TECHNOLOGY

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Importance of texturing,classification of textured yarns.Methods of texturising: False twist texturing machines.Properties of False twist textured yarns.Stuffer box crimping. Methods and machines for stuffer box texturising system. Edge crimping: Methods and machines for edge crimping. Gear crimping. Knit-de-Knit texturising system. Principle of draw texturising : draw texturising machine, machine settings. Principle and process of Air-jet texturising. Effects of machine variables on Air-jet textured yarn. Properties of Air-jet textured yarn. Modern developments in Air-jet texturising. Testing of textured yarns: Strength and elongation test. Degree of texturising and stability test for textured yarns.

Reference Books

Author	Title
1) A.A.Vaida	Production of Synthetic fibres.
2) MANTRA	A guide to crimping/Texturising Technology.
3) B.Pillar	Bulked yarn.

TT-410 PROCESS CONTROL IN WEAVING AND KNITTING

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Controls for quality, Machine stoppage and productivity in winding,warping,warping,sizing,drawing,pirn winding and weaving. Standerd norms for settings,speed and production rates.Fabric defects and their control. Grey fabric inspection, Standard for damages of cotton fabrics, Norms for causewise defects in grey fabrics Control & norms of hard waste in various processes.
Care,selection and consumption norms of accessories. Importance and types of Maintenance, maintenance schedule in winding, warping,sizing and loom shed. Calculations pertaining to production, efficiency and machine allocation in winding,warping,sizing and looms,concept of size addition and size losses in sizing,

KNITTING

Fabric quality,course length,weight per unit area,cover factor,measurement of loop length,control of loop length,knitted faults and their remedies,garment quality,fabric assesment,Dimensional property of knitted fabric,effect of yarn parameters on knitting Machines performance & fabric quality.

Ref.Books

Title	Author
1) Process Control in Weaving	ATIRA
2) Knitting Technology	D.J.Spenser.

TT-412 ADVANCED THEORY OF TEXTILE STRUCTURE

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

An introduction to an engineering approach to Textile structure; Textile properties & Textile structure,mechanics of simple yarn structures, Mechanics of bent yarn. Limit of twist,Mathematical approach for calculation of frequency of migration & order of migration. Application of buckling mechanism to yarns.Analysis of tensile forces in spun yarn. Kinematics of twisting,extension & breakage of continuous filament yarn. Effect of twisting tension, Gauze length & twisting method on tensile properties for continuous filament & spun yarn. Qualitative view of spun yarn mechanics. Geometry of fabric structure, Peirce elastic thread model. Tensile properties of woven fabrics. Geometrical change during extension of cloth. Fabric load extension modulus. Buckling of fabrics, buckling of elastic material, bending diagram of fabric.Shear & drape of fabrics. Nature of shear, practical problems related to shear measurement.
Shear properties, experimental study of drape. Nature of fabric deformation in drape & generalised discussion. Introduction to objective measurement of fabric handle. Brief description of KES-F and FAST. Detail analysis of FAST control chart.

Ref.Books:-

Title	Author
1) Textile Yarns	Goswami,Martindale & Scardino
2) Structural Mechanics of Textiles Yarns	Hearle,Grossberg & Backer
3) Textile Structure	Zurick

TT-414 Technical Textiles

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction to Technical Textiles Tyre cord-raw material like rayon, nylon & polyester. Brief idea of production of cord fabric.
Textiles as filter media. Characteristics of filter material.Basic idea of theory of filteration.Characteristics of fibres to use in different filter media. Application of woven, nonwoven and knitted fabric as filter media.Textiles as hygienic products. Mechanisms of abrorption and distribution of liquids in abrorbent products like diapers.Introduction to protective clothings, consumer needs, consumer perecption of garment in wear. Mechanical properties of fabrics & garment performance. Use of textile fibre in composite. Brief outline for production of fibre reinforced composite and uses. Introduction to synthetic leather production. Geotextiles - Overview of geotextile, geogrid & geomembrane & geocomposite.Designing is manufacture of geotextiles.Geotextiles properties & test methods.
Geotextiles - functions & mechanism in separation, reinforcement, stabilization filtration & drainage.Agricultural application of Textile.

Ref.Books

TItle	Author
1) Nonwoven Bonded Fabrics	Lulenschlos
2) International Conference on Geotextiles	J.N.Mandal

TT-416 HIGH PERFORMANCE AND SPECIALITY FIBRES

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Polymerization, spinning and properties of aromatic polyamides, high molecular weight polyester, rigid rod and ladder polymers such as BBL,PBZT,PBO,PBI. Manufacturing of carbon fibres from PAN precursors, viscose and pitch fibres. Glass fibres. Liquid crystal fibres. Gel spinning of polyethylene. Hollow and profile fibres, design of spinnerets for such fibres. Membrane technology. Blended and Bicomponent fibres. Medical textiles. Super absorbent fibres. Plasma modification. Radiation processing. Industrial tapes. Biaxially oriented films and film fibres. Barrier films and coating

TT-418 CLOTHING SCIENCE

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Factors involved in the study of Clothing. General functional description of clothing. Physiological and psychological aspects of fabric Comfort. Heat and moisture relations in clothing. Physical properties of clothing and clothing materials in relation to comfort; thermal resistance, water vapor resistance, wicking and air permeability. Influence of environmental conditions on the protective performance of garments. Field studies on the thermal protection of clothing. Bending and shear properties, clothing fit and drape. Fabric friction, static electricity and comfort. Aesthetic aspects of clothing. Influence of fibre yarn characteristics and fabric construction parameters on clothing comfort. Current trends and new developments in the study of clothing. New materials and finishes, new techniques, new concepts.

TT-420 NON COVENTIONAL YARN MANUFACTURE

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Summary of new spinning processes. Possibilities & limitations use of various spinning processes. Operating principles of Electrostatic spinning and Air-Vortex spinning. Self twist technique of spinning. Operating principle of warp spinning and Parafil spinning. The false-twist process: Generation of false twist, Forming a yarn with the aid of false twist spinning elements. Murata Jet spinner: operating principle, Raw material requirements, Yarn Characteristics, Interrelationship in spinning technology. Friction spinning : Operating principle, Technological interrelationship, Advantages & disadvantages Dref-2 process of Dr.E.Fehrer. DREF-3 process :Operating principle ,use of raw material.
Rotor Spinning: The development, Tasks of the rotor spinning machine, Principle of operation, Raw material requirements & preparation: The opening unit, Yarn formation : Fibre flow into the rotor, Formation of the yarn ,The false twist effect, wrapping fibres. The Rotor groove, Rotor diameter ,Combination of rotor dia,& rotor groove. The rotor bearing, Rotor revolutions, cleaning the rotor. Yarn withdrawal and winding: The direction of withdrawal, The navel, Withdrawal tube, Requirement for the package Automation. Technical data, Economic aspects of rotor spinning,
Fibre Characteristics required for different, leading spinning Technologies. Structure and properties of different types of yarns.

Ref.Books

	Title	Author
1.	Rotor Spinning	Salhotra & Isthiaque
2.	New Trends in Textile machinery	S.M.Isthiaque
3.	Rotor Spinning	V.A.Rolhena
4.	Manual Textile Vol-5 & 6.	W.Klein

TT-422 Nonconventional fabric Manufacture

Internal Marks: 40 **L T P**

External Marks: 60 **3 1 0**

Total Marks : 100

Yarn preparation for shuttle less Weaving:
Weft Preparation for shuttle less loom, warping and Sizing.
Maximum speed of shuttle loom, Design problem of shuttle Loom, Basic concept in increasing the weft insertion rate in Weaving machine.
Projectile Weaving machine:
Basic principle of projectile loom, sequence of weft Insertion, cam drive shedding mechanism, beat-up torsion bar Picking system, loom timing, checking of gripper, Let-off and Take-up motion, Tuck-in selvedge formation, returns of gripper. Technical specifications.
Air jet weaving machine:
Problem of air jet principle of weft Insertion. Path of the yarn in the air jet loom sequence of Weft invention in air jet loom. Design of an Elite confuse Guide, Design of profile reed, & relay jet. Loom Timing, Technical specification.
Water-jet:
Weft incretion mechanism, quality of warp Required for water- jet, selvedge formation, Environment Problem, Quality of water, Problem of water-jet loom.
Rapier Weaving Machine:
Different types of rapier weaving Machines. Weft insertion sequence in rapier weaving process. Different methods to drive the rapier head. Single phase Double acting rapier. Velocity of the rapier. Loom timing, Technical Specification of rapier weaving machine.
Multi phase Weaving Machine:
Basic concept of multiphase weaving. Shedding operation in warp way and weft way Multiphase loom. Advantages & disadvantages of multiphase Weaving process, Circular loom, Yarn path & Weft incretion in Circular loom.
Narrow Fabric Loom:
Different type of narrow fabric mechanism of weft insertion and fabric formation in narrow fabric weaving machine.
Carpet weaving: Woven carpet, its design, and process of manufacturing, (wilt on & Brussels). Technical specifications and its uses.
Non-woven technology: Fibers used in non-woven, on woven Fabric and its classification reason for development, Web making (Parallel, transverse, cross and random lay Web). Elementary idea about manufacturing adhesive bonded And needle punch fabric. Use of non-woven.
Multiracial Warp knitted fabric: Concept of multiracial Fabric. Method of manufacturing the multiracial Warp knitted Fabric, its uses as Technical Textiles.
Ref.Books

Title	Author
a) Shuttless Weaving	Svaty & Talavasek.
b) Modern Weaving	R.B.Gupta
c) Non-Woven Bonded Fabric	Lulenschloos
d) Non-Woven	BTRA

TT-424 CHARACTERISATION OF FIBRES/POLYMERS

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Importance of molecular weight in polymers/fibres. Number average and weight average molecular weights. Analytical techniques for characterization of number and weight average molecular weight and conformation, e.g., light scattering, dilute solution viscosity, osmometry, GPC. Techniques of structure characterisation. Electron Microscopy; basic idea about scanning and transmission electron microscopy. Use of electron microscopy in structural characterision of fibres/polymers. Use of X-ray diffraction in the structural characterisation of fibres /polymers. Determination of molecular orientation ,degree of crystallinity in polymers/fibres using X-ray diffraction.

Phase transition in polymers,1st order and 2nd order transitions in polymers. Determination of transitions in polymers by thermal or thermomechanical techniques. Techniques for thermal & thermomechanical characterisation, e.g, thermo-gravimetric analysis, differential scanning calorimetry (D.S.C.),differential thermal analysis (D.T.A.).

Dynamic mechanical testing; importance and utility of dynamic mechanical properties. Techniques used to measure the dynamic mechanical properties, e.g, sonic modulus tester.

Ref.Books

	Author	Title
1.	Sperling	Physical Polymer Science
2.	Tagger	Physical Chemistry of Polymers
3.	R.S.Stein	Newer methods of Polymer Characterization.

TT-426 ADVANCED FABRIC STRUCTURE

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Traditional loom Mountings and special jacquards. Uncommon woven structures : Lappet and suivel weaving etc.
Backed Fabric:
Type of backed fabric, weaving plans, conditions of dropping and lifting stitching ends/picks, wadded backed fabrics.
Gauze & Leno Weaves:
Feature of these weaves, method of preparation, weaving plans, types. Extra attachments required and control of these attachments. Methods to control tension over crossing ends.
Double Fabric:
Object of preparation, types, specialities of these types and their weaving plans (self stitched, centre stitched, interchangeable thread/fabric etc),Principle of Dropping & Sifting of stitching ends/picks.
Extra warp and Extra weft figuring: Method Of preparation, comparison of two of two methods. Control over compactness of weaves.
Warp & weft pile fabrics:-
Terry pile structure,method of production,extra attachments required.All-over pile structures,figuring with pile threads. Card cutting, warp pile fabrics produced on face to face principles, All-over and corded velveteens,weft plushes,figured weft pile fabrics.
Tapestry structures:-
Warp and weft faced tapestry structures in single and combination.
Damasks and compound brocades:-
Damarks and their preparation. Figaured warp rib and multiweft brocades.
Spool and Gripper axminster carpets:-
Spool axminster system : Spool setting its presentation,loom operation,Tuft insertion. Gripper axaminster system:
Selection of pile colours,Tuft insertion and general features. Spool-Gripper system.
Ref.Books:-

Title	Author
1) Advance Watsons Textile Design & Colour	Watson
2) Grammer of Textile Design	Nisbeth
3)Principles of weaving	Mark &Robinson

TT-428 PROCESS CONTROL IN TEXTILE CHEMICAL PROCESSING

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Review of different steps of chemical Processing of Textiles. Process parameters involved :- Optimised Process Parameters of each process imparted to textiles in preatment viz.Singeing, desizing, scouring, bleaching,mercurisation.Optimised dyeing parameters for dyeing for printing of diffetrent fibres through various styles. Optimised finishing parameters to impart various finishes on different fibres.Process parameters/process modification/any other changes.Change in quality due to selection of impure starting chemicals/faulty fabric/machine handing. Analysis of various chemical processing steps in terms process and quality control.Methods to asses quality of processed product after every stage of processing and that of final product. Standarrisation of instruments/ machineries, analysis of colour to check impurity percentage,evaluation of chemicals to check their efficiencies.

Ref.Books

Title	Author
1) Process & Quality Control in Chemical Processing	ATIRA
2) Process & Quality Control	ITA

TT-430 POLYMES AND SURFACTANTS FOR TEXTILES

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Surfactants: Classification and organic chemistry of surfactants, micelllization. Applications of surfactants in textile-emulsification, foams, wetting, solid dispersions in liquids, solubalization, detergency etc. applications of Polymers in Textiles. Properties and Requirements for Polymers for sizes, Thickeners, binders, adhesive, Coating Polymers and finishing agents. Chemistry of following Polymers/copolymer Systems-Preferred Polymerization Technique, desirable Co monomers, Commercial process, Properties and Specific application: Modified Natural Polymers-Starch/Cellulose/Guar Gum based polymers, PolyAcrylic/Methacrylic Acid, Poly Vinylacetate and poly(Vinylalcohol), Polyurethanes, Poly(Vinyl Chloride)/PVDC/Fluro Polymers, Rubbers/Styrene based Polymers, Poly(Siloxanes) and other related Polymers.

TT-432 GARMENT MANUFACTURING TECHNOLOGY.

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Brief outlook of garment manufacturing industry and its classification. Concept of garment design and proportion. Low stress mechanical properties of fabrics and their effect on garment production sequences. Anthropometrics; garment sizing. Pattern making and grading. Principles of marker making; spreading and cutting. Cutting methods. Quality control in cutting room. Stitch classification, seam types and applications. Sewing faults, their causes and remedies. Choice of sewing needles and threads. Different types of sewing machines and their principles. Work aids-folders, presser feet, feeding systems. Outline of fusing and pressing machines. Apparel production systems and material handling. Quality control systems in garment manufacturing. Garment dyeing and finishing.

Physiological and psychological aspects of fabric comfort. Heat and moisture relations in clothing.

Recommended books :-

1. H Carr & B Latham, 'The Technology of Clothing Manufacture', (Blackwell Sciences)
2. G Cooklin, 'Introduction to Garment Manufacture', (Blackwell Sciences)
3. A J Chuter, 'Introduction to Clothing Production Management', (Blackwell Sciences).
4. T Brackenbury, 'Knitted Clothing Technology', (Blackwell Sciences).
5. N Bray, 'Dress Pattern Designing', (Blackwell Sciences).
6. R M Liang & J Webster, 'Stitches and Seams', (Textile Institute).
7. A J Chuter, 'Quality Management in Clothing and Textile Industries', (Textile Institute).
8. R Lawson, A Hunter and R E King,'Textile Clothing: Pipeline & Q R Management', (Textile Institute).

TT-434 COMPUTER IN TEXTILES

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Introduction to computer aided desigen. Computers on the Indian Textile scheme. Linear programming in cotton mixing. Computer analysis of open end spinning. Use of computer in synthetic fibre industry. Automatic in spinning; computerized determination of principal technical & economic parameters. Microprocessor application in texile machinery. Continuous quality control in modern yarn production.Use of personal computer in specialized testing of textiles. Computer aided woven fabric design. A study of the pattern preparation unit in knitted fabric. Use of
acquisition and analysis for a system of fabric objective evaluation. An integrater information system of fabric objective evaluation. An integration information system for textile mill.

Ref.Books

Title	Author
1) Computer in Textiles	Textile Institute

TT-436 MARKETING & FINANCIAL MANAGEMENT IN TEXTILES.

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

MARKETING MANAGEMENT:
Marketing - its definition & core concepts. Marketing Management Production concept. Product concept. Selling concept, Marketing and societal Marketing concept. Marketing Information system. Marketing Research Process and various research designs. Consumers Behaviour, Factoring affecting CB, Buyer decision Process and Type of Buying Behaviour. Marketing Mix : Product-Levels of Product, Product hierarchy, stages in New Product development. Product life cycle & its stages. Product Mix, Product time. Branding - Packaging and labeling. Price - Pricing strategies & setting the price. Place - Channels of distribution, functions & its flow. Promotion - Mix : Advertising, sales Promotion. Personnel selling & Public relations, Factors in setting the Promotion mix. With supporting examples from Textile Industry.
Financial Management:
Management Accounting - Accounting concepts and financial statements. Various finance functions & financial objectives of firms. Sources of finance cost classification and cost of capital. Working capital Management - Concept of cross & net W C, classification of working capital. Factors determining the requirement of working capital. Capital Structure - Factors affecting capital structure. Capital Budgeting - its importance & methods of capital Budgeting.

Ref.Books:-

Author	Title
Philip Kotler	Marketing Management
I.M.Pandey	Financial Management

TT–438 Waste Management & Pollution control in Textile Industries

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

Impact of man on enviornment :

The Biosphere,the hydrologic cycle, the nutrient cycle, consequences of population growth, energy problem, pollution of air, water, soil & noise.

Air Plooution :

Defination and concentration, classification & properties of air pollutants. Emission sources,Effect of air pollution on health, vegetation & material damages. Laws and standards.

Basic concept of air pollution control methods & equipment.Role of Textile Industry in creating air pollution.

Textile fabric as a air pollution control medium.

Water Pollution :

Defination & concentrations, classification & properties of water pollutants. Sources of water pollution. Effect of water pollution on health, vegetation & material damages. Laws & Standards.

Role of textile industry in creating water pollution, e.g., effluents from sizing, desizing, scouring, bleaching, dyeing & finishing. Character of the effluents from different processes.

Methods to control pollution from textile industry effluents.Techniques of effluent treatment.

Noise Pollution :

Role of textile industry in creating noise pollution. Measures to reduce noise pollution in textile industry.

TT-440 WOOLLEN TECHNOLOGY

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
Total Marks : 100

WOOL FIBRE & ITS PROPERTIES:
Sheep breeds, sheep raising.Morphology and physical properties of wool like length,micron diameter, strength, elongation, TEM, etc.

WOOLLEN OR CARD YARNS:
Reclaimed wool, secondary wool, rag picking and garnetting shoddy & mungo).
Wool blends for woolen yarns and oiling
Woollen carding:- Mechanism & settings.
Woollen spinning:- Mule, Cap spinning (only concept),ring spinning.
Semi-worsted and worsted spinning system.

TOP PREPARATION FOR WORSTED SPINNING:
Sorting, scouring and drying. Worsted carding:- Mechanism, setting back, washing and drying.Gilling, autolevelling, oil emulsion, combing and top making.

WORSTED YARN SPINNING:
Tow to top conversion of filament for multilength fibre, staple fibre for blending with worsted top, worsted drawing, roving and ring spinning - details of the mechanism and setting. Yarn twisting or doubling. Clearing of yarn and winding Norms for woollen and worsted yarn quality of international level.Modern developments in woollen worsted spinning.

FABRIC MANUFACTURE:
Weaving preparatory for woollen and worsted system.Selection and setting of weaving machines for woollen/worsted/blended fabrics.On line control of productivity and quality.

DYEING, CHEMICAL PROCESSING & FINISHING:
Impurities present in raw wool and batch and continouse methods of scouring of wool at fibre, yarn and fabric stage. Carbonization of wool bleaching of wool.Felting andd antifelting treatments on wool with principles
involved. Brief outline of commercial methodss used. Chemistry of dyeing of wool and blends with various dyes such as Acid dyes, acid modant and metal complex dyes, reactive dyes, dyeing of wool in top form. Winch dyeing machine for wool dyeing. Introduction to various dry and wet finishing treatments for introduction to various dry and wet finishing treatments for woollen, worsted and blended fabrics with particular reference to decatising. Modern developments in dyeing finishing and use of modern machines.

TESTING & QUALITY CONTROL:

Important physical & chemical properties of virgin wool.
Measurement of diameter, length, strength, elongation, bulk, vegetable matter base, wool base, colour contamination, moisture and c.v.% as required.
Performance testing of the product, FAST by simple testing.

Dyeing shed development and matching.

Study of product defects at each stagee of production, their causes, prevention and remedies.

TT-406 MAJOR PROJECT

Internal Marks: 120	**L T P**
External Marks: 80	**0 0 8**
Total Marks : 200	

A comprehensive problem involving the various technologies of textile engineering will be frame. The student will be required to complete their project and submit a comprehensive report.