Punjab Technical University
Jalandhar

Scheme and Syllabus
of
Textile Engineering.

Batch-2011

By Board of Studies Textile Engineering

Punjab Technical University, Jalandhar
B.Tech. Textile Engineering.
Scheme of Syllabi 3rd Semester

Course Code	Course Name	L	T	P	EXT.	INT.	TOTAL	Credits
BTTE -301	Textile Fibre-I	3	1	0	60	40	100	4
BTTE-302	Introduction of Textile Engineering	3	1	0	60	40	100	4
BTTE -303	Polymer and Fibre Science	3	1	0	60	40	100	4
BTTE -304	Applied Mechanical Engineering	3	1	0	60	40	100	4
BTTE -305	Elements of Instrumentation & Control Engineering.	3	1	0	60	40	100	4
BTTE -306	Laboratory-I (Textile Fibre)	0	0	2	20	30	50	1
BTTE -307	Laboratory-II (Introduction of Textile Engineering)	0	0	2	20	30	50	1
BTTE -308	Laboratory-III (Applied Mechanical Engineering)	0	0	2	20	30	50	1
BTTE -309	Workshop Training				20	30	50	
	TOTAL	**15**	**5**	**6**	**380**	**320**	**700**	**23**

Note

- BTTE-304, BTTE-308, BTTE-309: These courses will be taught by faculty of Mechanical Engineering/Workshop
- BTTE-305: This course will be taught by the faculty of Electrical Engineering

- **Punjab Technical University, Jalandhar**
  B.Tech.Textile Engieering.
  Scheme of Syllabi 4th Semester

Course Code	Name of the subject	Weekly Load L T P	Total Teaching Load	Maximum Marks			
				Internal	External	Total	Credits
BTTE-401	Yarn Manufacture-I	3 1 0	4	40	60	100	4
BTTE-402	Textile Fibre-II	3 1 0	4	40	60	100	4
BTTE-403	Fabric Manufacture-I	3 1 0	4	40	60	100	4
BTTE-404	Textile Chemical Processing-I	3 1 0	4	40	60	100	4
BTTE-405	Fabric Structure & Analysis	3 1 0	4	40	60	100	4
BTTE-406	Lab.IV (Yarn Manufacture)	0 0 2	2	30	20	50	1
BTTE-407	Lab.V (Fabric Manufacture)	0 0 2	2	30	20	50	1
BTTE-408	Lab.VI(Textile Chemical Processing)	0 0 2	2	30	20	50	1
BTTE-409	Lab.VII(Fabric Structure & Analysis)	0 0 2	2	30	20	50	1
	General Fitness					100	
Total		**15 5 8**	**28**	**320**	**380**	**800**	**24**

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

Punjab Technical University, Jalandhar
B.Tech.Textile Engineering.
Scheme of Syllabi 5th Semester

Course Code	Course Name	Weekly Load			Total Teaching Load	Maximum Marks			
		L	T	P		Internal	External	Total	Credits
BTTE-501	Properties of Fibres	3	1	0	4	40	60	100	4
BTTE-502	Yarn Manufacture-II	3	1	0	4	40	60	100	4
BTTE-503	Fabric Manufacture-II	3	1	0	4	40	60	100	4
BTTE-504	Textile Chemical Processing-II	3	1	0	4	40	60	100	4
BTTE-505	Textile Testing	3	1	0	4	40	60	100	4
BTTE-506	Lab.VIII (Yarn Manufacture)	0	0	2	2	30	20	50	1
BTTE-507	Lab. IX (Fabric Manufacture)	0	0	2	2	30	20	50	1
BTTE-508	Lab.X (Textile Chemical Processing)	0	0	3	3	30	20	50	2
BTTE-509	Lab.XI(Textile Testing)	0	0	3	3	30	20	50	2
BTTE-510	Industrial Training					30	20	50	
Total		15	5	10	30	350	400	750	26

Punjab Technical University, Jalandhar
B.Tech. Textile Engineering.
Scheme of Syllabi 6th Semester

Course code	Course Name	Weekly Load			Total Teaching load	Maximum Marks			
		L	T	P					
						Internal	External	Total	**Credits**
BTTE-601	Theory of Textile Structure	3	1	0	4	40	60	100	4
BTTE-602	Process control in Textiles	3	1	0	4	40	60	100	4
BTTE-603	Knitting Technology	3	1	0	4	40	60	100	4
BTTE-604	Statistical Methods & Quality Control in Textiles	3	1	0	4	40	60	100	4
BTTE-605,606, 607	Departmental Elective-I	3	1	0	4	40	60	100	4
BTTE-608	Engineering Economics and Industrial Management	3	1	0	4	40	60	100	4
BTTE-609	Lab.XII (Knitting Technology)	0	0	2	2	30	20	50	1
	General Fitness					100		100	
Total		18	6	2	26	370	380	750	25

Note

- BTTE-608 This course will be taught by faculty of Management.

Punjab Technical University, Jalandhar
B.Tech. Textile Engineering.
Scheme of Syllabi 7th Semester

Course Code	Course Name	Weekly Load L T P			Maximum Marks			Credits
					Internal	External	Total	
BTTE-701	Industrial Training (4months)				300	200	500	12
BTTE-702	Software Training (2months)	4		4	150	100	250	8
					Total		750	20

Punjab Technical University, Jalandhar
B.Tech.Textile Engineering.
Scheme of Syllabi 8thSemester

Course Code.	Course Name	Weekly Load			Total Teaching Load	Maximum Marks			
		L	T	P					
						Internal	External	Total	Credits
BTTE-801	Mechanics of Textile Processes	3	1	0	4	40	60	100	4
BTTE-802	Mill Planning and Management	3	1	0	4	40	60	100	4

BTTE-803, 804,805, 806	Departmental Elective-II	3	1	0	4	40	60	100	4
BTTE-807, 808,809, 810	Departmental Elective-III	3	1	0	4	40	60	100	4
BTTE-811, 812,813	Departmental Elective-IV	3	1	0	4	40	60	100	4
BTTE-814	Project				8	90	60	150	8
	General Fitness					100		100	
Total					28	390	360	750	28

List of Departmental Electives:

DEPARTMENT ELECTIVE-I

Sr. No.	Course Code	Course Title
1.	BTTE-605	Non Woven Technology
2.	BTTE-606	Multi fibre process
3.	BTTE-607	Post Spinning Operation

DEPARTMENT ELECTIVE-II

Sr. No.	Course Code	Course Title
1.	BTTE-803	Texturing Technology
2.	BTTE-804	Technical Textiles
3.	BTTE-805	High Performance & Specialty Fibers
4.	BTTE-806	Non Conventional Fabric Manufacture

DEPARTMENT ELECTIVE-III

Sr. No.	Course Code	Course Title
1.	BTTE-807	Non Conventional Yarn Manufacture
2.	BTTE-808	Advanced Fabric Structure
3.	BTTE-809	Process Control in Chemical Processing
4.	BTTE-810	Human Resource Management

DEPARTMENT ELECTIVE-IV

Sr. No.	Course Code	Course Title
1.	BTTE-811	Garment Manufacturing Technology
2..	BTTE-812	Marketing & Financial Management in Textiles
3..	BTTE-813	Waste Management and Pollution Control in Textile Industry

Note BTTE-810, BTTE-812: These courses will be taught by Faculty of Management

BTTE-301 TEXTILE FIBRE –I

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

Objectives:
Textile Product properties and use are dependent on their raw material, structure and properties. Fibres are the basic input for textile manufacturing systems. This subject will help students to have the knowledge about the classification of fibres, properties and their manufacturing processes.

Prerequisite: Chemistry

Introduction: Fibre, Textile fibre, Staple fibre, Filament fibre, Natural fibres, Manmade fibres, regenerated and Synthetic Fibres, Classification of textile fibers.

Properties of fibres and polymers: Essential and desirable properties of textile fibers, Essential properties of fibre forming polymers.

Crystallinity and Orientation: Orientation and crystallinity in fibres.

Production properties and uses of Major natural 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.

Man Made Fibres inroduction: 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, Properties and uses of regenerated fibres: Production, Physical & Chemical structure, properties and uses of regenerated fibres (eg. viscose, polynosic, cellulose acetate).

Recomended Books:

1. Textile Science by E.P.G Gohl & Valensky (1987 1st Indian Edition CBS Publishers)
2. Hand Book of Rayon by Century Rayon (1970 1st edition)
3. Textile Fibre by V.A.Shenai (1995 vol-1 Bombay Sevak Publishers)
4. Technology of fibrins material by Sadov (1978)

BTTE-302 Introduction of Textile Engineering

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

Objectives:
This subject introduces basic terminology, raw materials and processes used in textile manufacturing.

Topic including job & entrepreneurial 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 by V.A.Senhai (1995 vol-1 Bombay Sevak Publishers)
2. Manual of Textile Tech by W.Klein (Textile Institute 1995)
3. Essential Elements of Textile Calculations by T.K.Pattabhiram(2nd Edition Textile Trade Press Ahmedabad)
4. Textile Science by Gohl & Valenski (1987 1st Indian Edition CBS Publishers)

BTTE-303 Polymer & Fibre Science

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

Prerequisite: Chemistry
Objective: The purpose of this course is to impart the knowledge of various characteristics of polymers.

Classification of polymers: 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.

Recommended Books:-

1. Polymer Science by W.Billmeger (2007 Pushp Print Services N. Delhi)
2. Physical Chemistry of Polymers by A.Tager (2nd Edition 1978 Mir Publishers)
3. Polymer Science by Gowareker (New Age Int. Pub. Ltd. 2007)
4. An Introduction to polymer physics by I.I.Perepechko (Mir Publishers 1981)

BTTE- 304 APPLIED 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.Book

1. Theory of Machine by Beaven (3^{rd} Edition Pearsons Education)
2. Theory of Machines by Khurmi & Gupta (14^{th} edition Eurasia Publishing House 2005)

BTTE-305 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:

1. Modern control system by Richard C.Dorf (2^{nd} Edition 2009 Pearson Education) .
2. Automayic control system by B.C.Kuo (8^{th} Edition 2003 John Wiley & sons)
3. Process control instrumentation technology by C.Johnson (2006 Pearson Education)
4. Electricals & Electronics measurements.by A.K.Sawhney (1994 Dhanpat Rai Co.)

BTTE - 306 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 content in cotton fibres.
14. Effects of acids, alkalies and oxidising agents on natural and synthetic fibres.
15. Determination of fibre maturity percentage in cotton fibres.

BTTE - 307 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
Preparation of lea & hank and calculation of fineness.

Calculation of count of yarn using different instruments.

Determination of twist.

To study the objects of different beaters/openers.

To study To study the working principle of trash analyser

To study the working principle & path of the material in a carding machine.

To study the working principle & path of the material in a drawing frame.

To study the working principle & path of the material in a roving frame.

To study the working principle & path of the material in a spinning frame.

To study the working principle & path of the material in a winding machine.

To study the working principle of conventional weaving machine.

To study the working principle of non-conventional weaving machine.

To study the working principle and yarn path of circular & flat knitting machine.

Study of all the processing machines.

Dyeing of fabic/yarn with direct dyes.

Study of different techniques of printing.

BTTE-308 Lab.III (APPLIED 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
- Study of various mechanisms; Slider Crank & their inversions, Four bar etc.
- Study of various types of braks & dynomometers.
- Study of various type of gears & gear trains.
- Study of cam followers mechanisms.
- Kinematic analysis of cam follower mechanisms.
- Static & dynamic balancing of rotating masses.
- Study of the moles of boilers such as: Cochran, Locomotive, Babcock & Wilcox
- To find C.O.P. of a refrigerator.
- To find C.O.P. of water cooler.
- To find coefficient of Thermal Conductivity of a metal rod.
- To study the phenomenon of natural convection & find heat transfer.
- To find heat transfer through forced convection.
- To find heat transfer in parallel flow/counter flow heat exchanger.

BTTE-401 YARN MANUFACTURE - I

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

Prerequisite: ITE
Objective: Degree holder students are required to supervise and control the mechanical processing of fibres. The purpose of this course is to impart the knowledge of various machines required for mechanical processing of fibres.

Ginning: Objects of ginning. Differential ginning. Roller, Saw and McCarthy ginning machines.

Blow Room: 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, its modern development. Study of Lap forming mechanism, Calendar roller pressure, 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. Degree of opening. Norms, Recent development in Blow room, Calculation pertaining to blow room. Selection of Blow Room line for different types of cotton fibre.

Carding: 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. Recent development in Card.

Darwframe: Objects of drawing, principles 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 pertaining to draft and production of draw frame machine.

Recommended Books:-

1) Manual of Textile Technology Vol. I-III. by W.Klein (1995 textile Institute)

2) Spun Yarn Technology Vol-I,II by Venkatsubramanian (Mub. Sevak Pub.)

3) Manual of Cotton Spinning by Textile Institute Manchester (1961 Textile Institute Butterworth Pub.)

4) Cotton Spinning by W.Tagert (1996 Pub- Mr. S. A. Shroff)

5) Spinning of Man-Made & its blend on Cotton system by Salhotra K.R. (1985 CSIR Publications)

6) Opening, Cleaning & Carding by S.Sazaloki

7) Spun Yarn Technology by E.Oxtoby (Mar 1969)

BTTE-402 Textile Fibre-II

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

Objectives:
This subject will impart the knowledge to the students about the structure, properties and their manufacturing and processing techniques of commonly used man made fibres.

Prerequisite: Textile Fibre -I

Introduction: Introduction to man-made fibres, Idea about fine structure of man-made fibres.

Crystallinity, orientation: Crystallinity, orientation and its effects on fibre properties.

Melt Spinning: 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: 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.

Heat Setting: Introduction about heat setting. Important parameters of heat setting & their effect on fibre properties.

Drawing and Stretching: Introduction about drawing. Drawing condition, phenomenon of necking, Machines for stretching continuous, filament yarns, Drawing, heat setting, crimping of staple fibres.

Production Properties and uses of Syntheic Fibres: Detail study of the production, physical, chemical structures & properties of polyester, nylon 6 & 66, polypropelene,acrylic, Elementary idea about high speed spinning.

High Performance Fibres: Introduction to high performance fibres, Elementary idea about aramid, carbon & glass fibres.

Ref.Books:-

1) Production of Synthetic fibres. by A.A.Vaidya (1988 Prentice Hall of India Pvt. Ltd.)

2) Man-made Fibre Sc.& Tech. by Mark, Atlas, Cernia Vol. I,II,III. (1967-68 Interscience Publishers)
3) Fundamentals of fibre formation by A. Ziabicki (1976 John Wiley & sons)
4) Man Made Fibres by R.W. Moncrieff (1970 Spinnet View)
5) Textile Fibre to Fabric by Bernard P. Corbman (6th Edition 1983 Mcgraw Hill)

BTTE-403 FABRIC MANUFACTURE-I

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

Objective: This subject deals with basic idea about the preparatory as well as weaving operations.

Prerequisite: ITE

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 drawingsystems.

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:-

1. Textile Mathematics by J.E.Booth (1995 CBS Publishers N. Delhi)
2. Weaving Mechanism by N.N. Bannerjee (1993 Textile Book House)
3. Winding by M. K. Talukdar (1992 Spinnet View)
4. Weaving calculations by A.Sengupta (1996 DBT & SONS Pvt. Ltd.)
5. Principles of Weaving by Marks & Robinson (Textile Institute Manchester 1976)
6. Conversion of Yarn to by Lord & Mohammed (2nd Edition 1982 Merrow)

BTTE-404 Textile Chemical Processing – I

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

Prerequisite: Chemistry, Textile Fibres

Rationale:

The success of the coloration and finishing treatment depend on the uniformity and efficiency of the preparatory processes like desizing, scouring, bleaching and mercerization. This subject aims at imparting the knowledge of pre-treatment processes, their equipments, and controlling parameters, so that a technologist and handle the processes with confidence. Finishing processes have also been included here so that students can have the exposure about value addition that can be made to the ultimate product.

Introduction: Process line for pretreatment, colouration and finishing of textiles

Singeing: Object of the process, types of singeing, details of various singeing methods, drawbacks and advantages. Process and quality control aspects involved.

Desizing: Object, types, method details and mechanism of removal of starch in various methods. Efficiency of desizing.

Scouring: Objectives, mechanism of removal of impurities, recipe and controlling parameters involved. Scouring of coloured textiles. Scouring of natural, man made and blended textiles. Evaluation of scouring efficiency.

Bleaching: Objectives of bleaching. Hypochlorite, peroxide, chlorite and peracetic acid bleaching methods and their effectiveness on various textiles. Controlling parameters and mechanism involved in each method. Efficiency of bleaching.

Mercerization: Objectives, mechanism related to various physical and chemical changes in cotton during mercerisation. Process parameters and operation details. Causticization. Wet and hot mercerisation. Ammonia treatment of cotton. Performance of various mercerization /alkali

treatment processes. Assessment of efficiency of mercerization : Barium activity number, its determination and interpretation.

Pretreatment machineries: Singeing m/c, J-box, kier, mercerizing machine,

Heat setting: Objectives and mechanism of setting. Different methods of heat setting and their effectiveness on various man made textiles and blends. Heat setting conditions and controls. Heat setting of polyester, nylon, acetate and their blends. Evaluation of degree of heat setting.

Carbonisation: Objectives, selection of chemical, process details, trouble shoots, precautionary measures and efficiency of carbonisation.

Mechanical Finishes: Physical and chemical softening processes, selection of chemical and evaluation of softening. Calendering - its types, construction and function of various calendering m/cs. Sanforizing - method, mechanism and machineries involved. Evaluation of sanforizing.

Functional finishes : Problem of creasing, anti-crease finish on cotton. Choice of chemical, catalyst and process parameters. Drawback and advantages associated with use of various anti-crease chemicals. Measures to reduce release of formaldehyde. Water repellency and water repellent finishes on cotton. Evaluation of water repellency.

Books Recommended

1. A K Roy Choudhary, *"Textile Preparation & Dyeing"*, Science Publishers, USA (2006).
2. Peters R. H, "*Textile Chemistry*", Vol - II, Elsevier Publishing Company, London (1967).
4. Mittal R M and Trivedi S S, "*Chemical Processing of polyester / cellulosic Blends*", Ahmedabad Textile Industries Research Association, Ahmedabad, India (1983).
5. Karmakar S R, *"Chemical Technology in the pretreatment processes of Textiles"*, Textile Science & Technology Series, Vol-12, 1st Edition, Elsevier (1999).
6. Hall A J, "Textile Finishing", Haywood Books, London, 1996.
7. Technology of Bleaching& Mercerization V.A.Shenai
8. Textiles Auxiliaries& Finishing Chemicals Vaidya
9. Shenai V A and Saraf, N M, "Technology of Textile Finishing", Sevak Publications, Mumbai, 1990.

BTTE-405 Fabric Structure & Analysis

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

Objective: Fabric design is an important aspect which decides the aesthetics and application. This course will help the degree holder students to know about the various fabric structures.

Prerequisite: FM I

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

Textile Design & Color by Watson's (1988 7th Butterworth & Co. Lt d.)
Advanced Textile Design by Watson's (1989 7th Butterworth & Co. Lt d.)
Grammer of Textile Design by Nisbet (1994)

BTTE - 406 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 employed 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 eccentricity & shore hardness of top roller drafting rollers.

15. Maintenance and overhauling of draw frame machine.

BTTE - 407 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 & calculation of average velocity of shuttle.

13. Study of sley movement, construction and calculation of sley eccentricity.

BTTE- 408 Lab VII Textile Chemical Processing – I Laboratory

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 polyester goods
3. Scouring of P/C blended goods
4. Scouring of wool fibre
5. Degumming of silk
6. Bleaching of cotton with H_2O_2
7. Bleaching of cotton with $NaClO_2$
8. Bleaching of cotton with NaOCl
9. Bleaching of Polyester
10. Bleaching of P/C blend
11. Bleaching of jute yarns / fabric
12. To finish cotton fabric with

- Water repelling agent
- Urea – formaldehyde

BTTE - 409 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

BTTE-501 PROPERTIES OF FIBERS.

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

Objectives: The performance of textile structures is primarily decided by its raw material (fibre) characteristics. This course divulges the information about the various dimensions of fibre characteristics**.**

Prerequisite: TF I,TF II and PFS

Traditional View of fibre structure and its later development: Study of the methods of investigation of fibre structure, e.g, x-ray diffraction, electron microscopy and absorption of infra -red radiation. Fibre density and its measurement.
Moisture relations in Textile Fibre: Measurement of moisture absorption, measurement of regain, relationship between Moisture Regain and Moisture Content, Swelling of fibres-definitions and measurement. Heat of sorption- definitions, measurement and its effect on properties of textile material. Quantitative theory of moisture absorption. Hystersis of moisture absorption.
Tensile properties of fibre: - Factors determining the result of tensile tests. Quantities & units of different parameters. Experimental methods. Elementary study of Fibre fracture.
Effect of Variability: Effect of specimen length on strength, weak link effect.
Elastic recovery: Definition, experimental methods, change of properties as a result of straining.
Study of time dependence: creep behaviour, relaxation of stresses with time & its effect on tensile testing.
Introduction to dynamic testing: Basic concept & definition of elastic, viscoelastic and plastic deformations. Characterisation of viscoelastic behaviour, Concepts of Voight & Maxwell model. Test method for dynamic testing.
Bending & torsional rigidity of fibre: Elementary concepts, theories and measurements.
Fibre friction and its measurement: nature of friction & equations. Fibre to fibre and fibre to metal friction.
Basic concept of Thermal properties & heat setting
Optical properties of fibre: Definition of refractive index, concept of fibre birefringence and orientation, Dichroism.
Introduction to dielectric property & static charge generation in textile material.

Ref.Books:-

1) Properties of fibres by Morton & Hearle (4th edition Woodhead Pub.)

2) Physical Properties of Polymers by A.Tager (1979 Mir Publishers)

BTTE-502 YARN MANUFACTURE – II

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

Prerequisite: Introduction of Textile Engineering, Yarn Manufacture-I

Objective: Provide thorough knowledge about Comber, Roving frame and Ring Frame. The course will give basic idea about other systems of yarn manufacturing and yarn structure.

Introduction to short staple spinning: Brief idea about short staple spinning technology.
Combing process: Objectives, combing for shorter and medium varieties of cotton, cottons suitable for combing, preparation of stock for combing, combing cycle, role of machine components and settings, noil extraction at backward feed and forward feed comber, norms, performance assessment and production calculations. Recent developments.
Process related to roving formation: Objectives, functions of different machine components and high drafting system, roving twist in speed frame, winding principles and equations related to bobbin leading and flyer leading, building motion, production calculations, norms, performance assessment. Developments in speed frame.
Ring spinning Process: Function and mode of operation of ring frame, role of drafting system, yarn guiding devices, forces acting between ring and traveler, yarn tension variation, angle of yarn pull, tasks of traveller, limiting speed, classification, form of traveler, traveler mass and material, different ring-traveller combinations, fiber lubrication, running on new-ring, winding process, cop building, cylinder and conical tip, spinning geometry, causes of end breaks, production calculations, norms, performance assessment. Latest developments including compact spinning.
Non-conventional spinning processes: Brief idea about principle of open end spinning, rotor spinning, chief organs and their functions, yarn properties in comparison with ring-spun yarn, principle of friction spinning, function of chief organs, yarn properties, basic principle to air jet spun yarn, functions of chief organs, yarn properties.

Ref.Books

1. Klein W, “Manual of Textile Technology vol.1 to 5”, The Textile Institute, 1995.
2. Khare A R, “Elements of Combing”, Sai book center, Mumbai, 1999.
3. Khare A R “Elements of Ring Frame and Doubling”, Sai book Centre, Mumbai, 1999.
4. Salhotra K R, “Spinning of Man Mades and Blends on Cotton System”, The Textile Association of India, Mumbai, 1989.
5. Chattopadhyay R and Rengasamay R, “Spinning: Drawing, Combing and Roving”, NCUTE-Pilot Programme, 1999.
6. Lawrence C A, “Fundamental of Spun Yarn Technology” CRC Press, USA,2003.

2003.

BTTE-503 FABRIC MANUFACTURE - II

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

Objective: To impart comprehensive knowledge about latest advancement in weaving technologies and increase the student awareness in various secondary motions of loom.
Prerequisite: Fabric Manufacture-I

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:-

1. Principles of weaving by Marks & Robbinsons (1976 Textile Institute Manchester)

2. Shuttle less weaving by Talavashek & Svaty
3. Weaving Mechanism – II by Banerjee, N.N. (1994 Textile Book House)
4. Weaving:Conversion of yarn to fabric by Lord,P.R.& Mohamod,L. (2nd Edition 1982 Merro Publishers.)

BTTE-504 Textile Chemical Processing-II

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

Rationale:
Textile Engineers are responsible for quality of the final product that goes to the market. The market value of a textile product is decided by its aesthetics and functionalities. In this course, concept of colour has been introduced along with details of various dye categories, their application on various textile materials. Printing technology has also been made the part of this unit so that students can understand the mechanism of this style of fabric decoration.

Prerequisite Knowledge: TCP-1(Preparatory processes), Textile Fibres, Polymer Science

Concept of colour: Visible spectrum, wavelength and blindness of colour. Metamerism/isomerism.
Theories of colour: Additive and substractive theories. Primary, secondary, tertiary, complementary and contrasting colours. Tristimulus values of colour. Computer colour matching, kubelka-munk equation, refelectance factor, colour-co-ordinates, CIELAB values. Dye uptake on textiles.
Theory of dyeing: Dye-fibre interaction, free volume theory.
Dyeing of textiles: Dyeing technology of natural and manmade textiles with direct, reactive, vat, insoluble azoic, sulphur, solubalised vat, acid, metal-complex, basic and disperse dyes. Colouration with Pigments. Auxiliaries used in dyeing.
Dyeing of blends: Classification of blends, shades and methods for dyeing of blends. Suitability of each method for dyeing of specific blend.
Dyeing machineries: loose fibre, yarn and package dyeing machines. Jigger, winch, jet and HTHP beam dyeing m/cs. Padding mangles.
Printing methods: Hand block, roller and screen printing processes. Construction and working of roller printing machine, photoelectric method of screen preparation. Drawback and advantage of each method.
Print Paste: Constituent and characteristics of print paste, classification and mechanism of working of thickeners.
Printing after treatments: Importance of steaming, curing, ageing of prints. Mechanism of each process.
Printing Styles: Direct, discharge and resist styles of printing on natural, man made and blended textiles.

Transfer Printing: Types, mechanism of transfer in each type and machineries. Transfer printing of natural, man made and blended textiles.
Identification of dyes: Identification of dye on dyed natural and man made textiles.

Books Recommended:
1. Miles L W C, "Textile Printing", Dyers Company Publication Trust, Bradford, England, 1981.
2. Shenai V A, "Technology of Printing", Sevak Publications, Mumbai, 1990.
3. Nunn D M, "The Dyeing of Synthetic Polymer and Acetate Fibres", Dyers Company Publication Trust, London, 1979.
4.Shore J, "*Cellulosics dyeing*", Society of Dyers & Colourists, Bradford, UK (1979).
5. A K Roy Choudhary, "*Textile Preparation & Dyeing*", Science Publishers, USA (2006).
6. Cotton piece dyeing by ATIRA
7. Dyeing of Polyester & Cellulose Blends ATIRA
8. V.A.Shenai, "Technology of Dyeing"
9. The Dyeing Of Textile Materials by Jose Cegarra
10. Dyeing and chemical technology of Textile Fibre by E.R.Trotman
11.Chakraborty J N, "Fundamentals and Practices in Colouration of Textiles", Woodhead Publishing India Pvt Ltd.

BTTE-505 TEXTILE TESTING

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

Objective: Degree holder students are required to supervise and control the quality of the raw material to the finished product. This course will impart the knowledge, skills and analysis of various physical test carried out in the industry.

Introduction: Introduction to testing, selection of samples for testing: Sampling techniques, sample size and sampling errors.

Testing of Fibres: Moisture content & regain, relation between moisture regain and moisture content, 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.

Testing of Yarn: Measurement of yarn count, twist. Principle of yarn Evenness and imperfections testing of slivers, rovings and yarns, spectogram analysis, concept of index of

irregularity, nature and causes of irregularity, testing of textured yarns for crimp contraction and crimp stability. Yarn fault classification, Uster classimat. Yarn Hairiness, principle of measurement, measuring instruments.

Testing of Fabrics: 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.

Recommended Books:-

1. Principle of Textile Testing by J. E. Booth, 1st Edition 1996 CBS Publishers, New Delhi
2. Textile Testing by Augappan Vol. I and II (1997 SSMITT Co-operative Stores Ltd)
3. Physical Testing of Textiles. by B.P. Saville, Woodhead Publishing Ltd, Cambridge, 2002.
4. Testing and quality management by V.K. Kothari, IAFL Publication, New Delhi.

BTTE-506 Lab.VIII(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 detaching roller drive 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 traveler weight, yarn count and balloon height.
18. To perform various settings and maintenance operation on Ring frame; Such as:
    Ring rail leveling
    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 & traveler weight on hairiness.
21. Study the chief organs mechanism and calculations of open end and friction spinning machines.

BTTE-507 - 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.

BTTE - 508 Lab XI Textile Chemical Processing – II Laboratory

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 3**
Total Marks : 50

At least 10 experiments are to be performed by each student

1. To dye cotton with Azoic dyes
2. To dye cotton with Vat dyes
3. To dye cotton with Indigoid dyes
4. To dye wool fibre with

• Reactive dyes

• Acid dyes

• Metal complex dyes

5. To dye silk with acid dyes / acid mordant dyes
6. To dye polyester with disperse dyes
7. To dye nylon with acid dyes / metal complex dye
8. To dye acrylic with basic dyes
9. To print cotton fabric with hand block method in direct style
10. To print cotton fabric with hand block in discharge style
11. To print cotton fabric with hand block in resist style
12. Study of fastness properties of different dyed samples
13. Identification of dyes on dyed textiles
15. To dye the fabric with direct dye and it’s after treatment
16. To dye the fabric with reactive dyes
17. To dye fabric with Sulphur dyes

BTTE-509 Lab.XII (TEXTILE TESTING)

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 3**
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. 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 coefficient and maturity ratio of a given sample by caustic soda method.Give appropriate rating to the fibre sample.
5. Determine the bundle strength and elongation of a given manmade fibre using stelometer. Study the effect of rate of loading on tensile properties of the fibre.
6. Determine moisture content/regain of a fibre sample by hot air oven method.
7. Determine Crimp (arcs/cm and crimp %) of a given manmade fibre sample.
8. Determine stress relaxation and creep recovery of fibre.
9. 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.
10. Prepare yarns Appearance Boards and compare with ASTM standards.
11. Study the hairness of a given yarns using Hariness Tester. Compare the results of Evenness Tester and Hairness Tester with ASTM grade.
12. Determine coefficient of friction of a spun yarn and see the effect of waxing on coefficient of friction.
13. Determine bending rigidity by (HEART) loop method.
14. Determine the Lea C.S.P by Lea CSP Tester and Autosorter and compare the results.
15. Determine the percentage crimp and corrected count with the help of crimp Tester.
16. Determine the crimp rigidity by using hot crimp contraction method.
17. Characterise a woven fabric with respect to its dimensional properties.
- thread density

- yarn number
- yarn crimp
- weave
- cover factor
- areal density
- skeaness
- thickness

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

BTTE-601 THEORY OF TEXTILE STRUCTURE

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

Prerequisite: Fabric Structure & Analysis, Yarn Manufacture, Fabric Manufacture

Objective: Provide thorough knowledge about yarn and fabric structure. Different mechanics related with mechanical properties of yarn and fabric like tensile bending shear buckling. The course will provide structure property relationship of ring, rotor, air-jet, friction spun yarn

Yarn Geometry: Basic geometry of twisted yarns. The idealized helical yarn structure and deviation.
Real Yarn: Twist contraction and retraction, packing of fibres in yarn, Forms of Twisting.
Fibre Migration: Ideal migration, Parameters affecting migration, characterization of migration behaviour, mechanism of migration in single and plied structure. Criteria for interchange of fibre position. Conditions for migration to occur, combination of the mechanics of migration.
Structural Mechanics: Extension of yarn under small load. Analysis of tensile forces of yarn under stress. Prediction of breakage, Nature of rupture for continuous filament yarn. Extension and breakage of spun yarn: Traditional view and approach by Hearle and E1-Sheikh.
Blended Yarn: Blended yarn structure, Humburgers Theory. Structure property relationship of ring, rotor, air-jet, friction spun yarn.
Fabric Geometry: Engineering approach to the analysis of fabric, Pierce geometrical model relationship between h, p, c, Crimp interchange, Jammed Structure, concept of similar cloth. Minimum possible cover factor. Race track geometry, close limit of weaving, concept of similar fabric. Pierce elastic thread model, Geometry of plain knitted fabric.
Fabric Properties: An elementary idea about tensile, bending, shear and drape behaviour of fabric. An elementary idea about fabric objective measurement.

Ref.Books

1. Hearle J W S, Grosberg P and Backer S, “Structural Mechanics of Fibres Yarns and Fabrics”, Wiley Interscience, New York, 1969.
2. Goswami B C, Martindale J G and Scardino F, “Textured yarn technology, structure and applications”, Wiley Interscience Publisher, New york, 1995.
3. Peirce F T and Womersley J R, “Cloth Geometry”, reprint, The Textile Institute, Manchester 1978.

BTTE-602 PROCESS CONTROL IN TEXTILES

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

Objectives: Process control is the means to achieve the predefined quality standards. This course will impart the various aspects of quality control practised in spinning and weaving area to the students.

Prerequisites: YM, FM

Control of mixing quality and Cost; Formulation of LPP; Bale Management. Control of yarn realisation; Control of waste and cleaning in a spinning line; improving the machines performance and optimisation; Control of yarn quality; Yarn faults and package defects; Controls for quality, Machine stoppage and productivity in winding, warping, warping, sizing, drawing, pirn winding and weaving; Calculations pertaining to production, efficiency and machine allocation in winding, warping, sizing and looms; Standard norms for settings, speeds and production rates. Fabric defects and their control. Grey fabric inspection, Standard for damages of cotton fabrics, norms for cause wise defects in grey fabrics Control & norms of hard waste in various processes; Care, selection and consumption norms of accessories.

Machinery audit: Measurement and analysis of productivity: Means to improve productivity

Ref. Books;

1. Process Control in Spinning by ATIRA
2. Spinning of Man-made& their Blends in Cotton system by K.R.Salhotra,
3. Process control in spinning by R.Chatopadhaya, I.I.T Delhi
4. Quality Control in spinning by SITRA ,1994 Coimbtore
5. Process Control in Weaving by ATIRA

BTTE-603 KNITTING TECHNOLOGY

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

Objectives: Next to weaving is knitting is the most popular method of fabric manufacturing. This subjects deals with different types of knitting machines their functioning.

BASIC CONCEPT OF KNITTING, Basic warp and weft knitting. Difference between warp and weft knitting. Classification of knitting machine and their application. Comparison of knitted and woven fabrics.

WEFT KNITTING:
STUDY OF KNITTING ELEMENTS: Types and specifications of needles. Functions of sinkers. Basic knitting action of Beard, Latch and Compound needles
STUDY OF DIFFERENT TYPES OF STITCHES: knit, tuck and float and their effects on fabric properties and structures.
KNITTING CAM SYSTEMS for Plain, Rib, Interlock and Purl structures. Machine and mechanism for producing basic structures viz. - Plain, Rib, Interlock and Purl and their derivatives.
PROPERTIES AND USES of different types of weft knitted fabrics. **INTRODUCTION TO PETTERNING IN CIRCULAR KNITTING MACHINE:General concept,** Four cam track system, Pattern wheel and Pattern drum and design area calculations. Electronic needle selection. Computer controlled knitting machines.
STUDY OF HAND OPERATED V-BED FLAT KNITTING MACHINE and its cam system.

WARP KNITTING:
STUDY OF KNITTING ELEMENTS in Tricot and Raschel knitting machine and loop formation processes.
PATTERN MECHANISM, development of designs and properties of different warp knitted fabrics. Uses of warp knitted fabrics.
Study of Let-off and take-up mechanisms.
CONCEPT OF LOOP LENGTH and their effect on fabric structure & properties. Control of loop length and Positive Feed devices.
Basic study of knitting tensioning devices and stop mortions.
CALCULATIONS: Production calculations of knitting machines and fabric weight in g/m^2. Calculations of wales and courses per inch from k-factors. Tightness Factor and related calculations.

Recommended Books:-

1) Knitting Technology by D.J.Spencer (2^{nd} Edition Woodhead Publishers 1997)

2) Hosiery Technology by H.Wignal

3) Wool in Double Jersey by T.D.Brown

BTTE- 604 Statistical Method and Quality Control in Textile

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

Rationale:
Market acceptability of any product is decided by its quality. To ensure desired quality in the product, it is necessary to incorporate the quality control activities in the production processes. Extensive Advancements have been made in the area of quality management. This subject has been designed to give the students an awareness about the current practices and various tools, techniques and concepts which are of great help in maintaining and improving the quality level in an organisation.

Quality Management: Definition of quality and its importance, different approaches to quality, Description of Deming's fourteen points and Ishikawa's seven tools of quality, utility of statistical method for quality control and improvement, concept of Total Quality Management (TQM), ISO 9000 Standards, Quality Function Deployment (QFD) and Quality Costs.
Basic Approaches to Statistical Quality Control: Population and sample, descriptive and inductive statistics, discrete and continuous variables, subjective tests, collection and classification of data, frequency distributions, measures of central tendency, measures of dispersion, random variables and probability distribution, differences and applications of normal, binomial, Poisson's and other form of distribution.
Statistical Analysis for Continuous Function: Population and sampling distribution of mean, statistical estimation theory, points estimates, concept of single tail and double tail test, Student's t distribution, confidence limit, statistical decision theory, tests of hypotheses and significances, type I and type II errors, difference between two sample means. Test for single variance, Chi-square test, the F distribution, test for the difference between two variances, confidence limits for variance and ratio of two variances, choice of sample size.
Statistical Analysis for Discrete Function: Application of binomial and Poisson's distribution, normal approximation, test for a single proportion and difference between two proportions, application of χ 2 distribution, contingency table.
Subjective Tests: Rank correlation, tied rank, coefficient of concordance.
Acceptance Sampling: Basic idea about acceptance sampling, OC curve, producer's risk and customer's risk.
Control Charts: Advantages using quality control charts, random and assignable causes, action and warning limits, X **,** R, p , n p and c chart, Process Capability Ratio (CP and CPK), concept of 6 sigma process control, brief idea about CUSUM and EWMA chart.
ANOVA and Regression: Some basic concept of Analysis of Variance, method of least squares, Curve fitting, linear regression methodology, Karl Pearson correlation and standard error.

Books Recommended:

1. Leaf G A V, "Practical Statistics for the Textile Industry", Part-I and II, The Textile Institute, U.K, 1984.
2. Montogomery D C, "Introduction to Statistical Quality Control", Fourth Ed., John Wiley & Sons (Asia) Pvt. Ltd., Singapore, 2004.
3. Mehta P V, "Quality Management: An Overview", in '*Testing and Quality Management'*, Vol. 1, Ed. V K Kothari, IAFL Publication, New Delhi, 1999.
4. Spiegel M R and Stephens L J, "Schaum's Outlines Statistics", Third Ed., Tata McGraw Hill, New Delhi, 2000.
5. Walpole R. E. and Myers R.H., "Probability and Statistics for Engineers and Scientists", McMillan Publishing Company, New York, 1985.
6. Hayavadna J, Statistics for Textiles and Apparel Management"", Woodhead Publishing India Pvt. Ltd.
7. Charantimath Poornima M, "Total Quality Management", Pearson Publications.
8. Meloun Milan and Militky Jiri, "Statistical Data Analysis- A Practical Guide with 1250 exercises", Woodhead Publishing India Pvt. Ltd.
9. Nagla J R, "Statistics of Textile Engineers", Woodhead Publishing India Pvt. Ltd

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BTTE-605 NON-WOVEN TECHNOLOGY

L	T	P
3	1	0

Objective: To impart knowledge about fabric manufacturing process other than weaving and knitting

Prerequisite: Textile Fiber

Introduction to nonwovens, Classification of non-woven fabrics. Raw material - fibre - natural, synthetic , Various industrially produced fibres. Web formation: Dry-laid nonwovens from staple fibres, 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. Stitch bonding, End uses of non-woven fabric.

Reference Books

1 Non-woven bonded fabrics by Lunnenschloss
2 Nonwovens by N.N.Banerjee
3 Nonwovens by BTRA
4 Manual of Nonwovens by R. Kroma
5 Needle Punching by A.T.Purdy

6 Nonwovens by Gulrajani
7 Thermal bonding of Nonwoven fabrics by S.K. Batra

BTTE-606 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:-

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

BTTE-607 POST SPINNING OPERATIONS

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

Objectives 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.

Recommended Books:-

1) Production of Synthetic fibres by A.A.Vaidya (1988 Prentice hall India Pvt. Ltd.)

2) Texturing by MANTRA

3) Man-Made Fibre Sc.& Tech. by Marks,Atlas,Cernia Vol.I,II,III (1976-68 Intersciense Publishers)

4) Recent Advances in fibre Science by Ed.Mukherjee

BTTE-608 ENGINEERING ECONOMICS AND INDUSTRIAL MANAGEMENT

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

Objectives: To run an organization Finance and Human resources are the key factors. Their proper utilization decides its success. This course will give the basic understanding of both these resources.

Prerequisite: Basic Management Principles, C S.

Introduction: Scope of economics for engineers; Concept of: Goods, Utility, Value, Price, Capital, Money, Income; Law of Demand & Supply; Time value of money.

Cost Analysis: Cost classification: Prime cost , Overhead cost , Selling and Distribution Cost , Fixed cost, Variable cost, , Implicit cost, Explicit cost, Replacement cost, Opportunity cost, Marginal cost and Sunk cost; Break even analysis; Economic order quantity.

Depreciation: Causes and Methods: Straight line method, Reducing balance method, Repair provision method, Annuity method, Sinking fund method, Revaluation method, Sum of the digit method.

Replacement analysis: Reasons and factors for replacement; Determination of economic life of an asset; Payback period method, Annual cost method, Present worth method.

Human Resource Management: Definition; Functions of HRM; Process of Human Resource Planning; Methods of Recruitment; Meaning of Placement and Induction.

Training and Development: Difference between Training and Development; methods of training and development; Promotion: merit v/s seniority; Performance Appraisal: Traditional and Modern methods; Meaning of Career Planning and Development; Career anchors; Career paths for various types of jobs; Problems in career Planning and Development.

Job Satisfaction: Job Satisfaction and its Importance; Motivation and its theories: Maslow's, Herzberg's and Vroom's theories of motivation.

Integration and Maintenance: Employee Grievance and their redressal; Administration of Discipline; Labour Turnover; fringe and Retirement terminal benefit; Future Challenges for Human Resource Management.

Books Recommended:

1. Micro Economics' by T R Jain VK Publication.
2. Industrial Engineering and Management'by O P Khanna, Dhanpat Rai Publication (P) Ltd.

3.Industrial Engineering and Production Management by M S Mahajan Dhanpat Rai & Co. Pvt Ltd.
4. Human Resource Management byT N Chhabra ,Dhanpat Rai & Co.
5. Managerial Economics by Mehta P L, Sultan Chand & Sons.

* Seminar and Industrial Visit.

BTTE-609 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 Circular Knitting Machine.

4. To study the cloth take-down mechanism of Circular Knitting Machine.

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 needles, cam system & driving mechanism.

7. To study cam system of V - bed Flat Knitting Machine.

8. To study passage of yarn of Hand Operated V - bed Flat Knitting Machine.

9. Preparation of Fabric samples (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 Single Feeder Circular Knitting Machine.

11.To study the Positive Feed Device (IRO) on a Circular Knitting Machine.

12. To analyse plain, rib and Interlock knitted fabrics and their derivatives (course per inch, wales per inch, loop length, GSM & needle diagram)

BTTE-801 Mechanics of Textile Processes.

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

Objective: To impart mathematical and mechanical theory based knowledge behind various spinning and weaving mechanisms
Prerequisite: Fabric Manufacture, Yarn Manufacture

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.. Mechanism of package building and twisting in speed frame. Design of Cone drums for roving frame. Differential gearing in Roving frame. . 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.

Reference Books

1) Textile Mathematics by J.E.Booth (1996 CBS Publishers)
2) Carding by R. Chattopadhya

3) Principles of weaving by Marks & Robinson (1976 Textile Institute Manchester)

BTTE- 802 MILL PLANNING AND MANAGEMENT

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

Objectives:
This subject will help the students in developing their entrepreneurial skill in textile related activities.

Introduction: Introduction to mill planning and management, Functions of management, Forms of business organisations, Mill organisation.
Mill location : Mill location and site selection, Concept, Various factors affecting plant location.
Factory Buildings: Benefit of good buildings, Shape of factory buildings, Different types of factory building for Textile Mills and their advantages and disadvantages.
Plant Layout: Objectives of good plant layout, Types of plant layout, Plant layout Procedure, Calculation for different machines required and lay-out plan for Spinning, Weaving, and chemical processing.
Air conditioning and humidification: 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.
Material handling: Functions and Principles of material handling, Selection of material handling equipments, types, advantages, different terms related to it, ways to reduce material handling expenditure.
Working environment: Different measures of good working environment. Brief Idea about Environmental Pollution from textile industry and Its Control.
Noise and its Control: 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.
Lighting: 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.
Cost: Different costs, Elements of cost, Costing the products, Method of selection of cotton to minimize mixing cost, yarn selling price, conversion cost, cost reduction techniques, impact of end breaks in ring spinning on productivity and cost.

Ref.Books:-

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

f) Management of Textile Industry by Dudeja V D

BTTE-803 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. Stiffer 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

1) Production of Synthetic fibres. By A.A.Vaida

2) A guide to crimping/Texturising Technology by MANTRA

3) Bulked yarn. By B.Pillar

BTTE-804 TECHNICAL TEXTILES

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

Objective: The purpose of this course is to impart the inputs to the students regarding the application of Textiles in the diversified field.

Introduction: Definition and scope of Technical Textiles, Brief idea about technical fibres, composite materials and uses.

Filtration Textiles: Textiles as filter media. Characteristics of filter material. Basic idea of theory of filtration. Characteristics of fibres to use in different filter media. Application of woven, nonwoven and knitted fabric in filter media.

Medical Textiles: Introduction, Classification of Medical textiles, Textiles as hygienic products. Description of different Medical Textiles, Mechanisms of absorption and distribution of liquids in absorbent products like diapers.

Protective Textiles: Introduction to protective clothings, functional requirement of textiles in defence, Brief idea about ballistic protective clothing, Chemical protective clothing, flame retardant fabrics.

Sports Textiles: Functional requirement of different types of products.

Cords: Method of production and applications.

Geotextiles: Brief idea about geosynthetic. Geogrid, Geomembrane and Geocomposite. Designing and manufacture of geotextiles. Geotextiles properties and test methods. Geotextiles -functions and mechanism in separation, reinforcement, stabilization filtration & drainage. Agricultural application of Textile.

Recommended Books:-

1) Hand book of Technical textiles by A R Horrocks and S C Anand, Woodhead Publishing Ltd, Cambridge, 2002
2) Engineering with Geosynthetic by G V Rao and G V S Raju Tata McGraw Hills Publication, New Delhi 1990.
3) Wellington Sears Hand book of Industrial Textiles by Sabit Adanaur, Technimic Publishing company Pennsylavania USA 1995.

BTTE-805 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

Books Recommended:

1. Mc Crum N G, Buckley C P and Bucknall C B, "Principle of Polymer Engineering", Oxford University Press, New York, 1990.
2. High Performance Fibres, Ed. J W Stteare, Woodhead Publishing Co.,England, 2001.
3. Hull D, "An introduction to composite materials",Cambridge University Press,UK, 1981.
4. Broody H, "Synthetic Fiber Materials", Longman Scientific and Technical, UK, 1994.

BTTE - 807 Non Conventional Yarn Manufacture

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

Objective: Provide thorough knowledge different non conventional yarn manufacturing systems viz., rotor, air-jet, friction spun yarn. The course will also provide knowledge of Compact Spinning Other Spinning system like Self twist, twistless, warp spinning, Electrostatic spinning, Core-spinning, Siro spinning, Bobtex yarn manufacture, solo spun yarn manufacture. This course will also provide structure and properties of different types of yarns.

Introduction: Summary of new spinning processes. Possibilities & limitations use of various spinning processes. Fibre Characteristics required for different, leading spinning Technologies.
Rotor Spinning: Tasks of the rotor spinning machine, Principle of operation, Raw material requirements & preparation, Yarn formation, Specifications of different organs and effect of each on the process and product quality. New developments.
Air-jet Spinning: Principle and raw material preparation. Process and machine parameters affecting product quality. Principle of vortex yarn manufacture. Difference between air jet spun and vortex spun yarn structure.
Friction Spinning: Principle and raw material preparation, process and machine parameters affecting product quality. Difference between DREF-II and DREF-III yarn structures and properties.
Compact Spinning: Principle and raw material preparation. Comparative assessment of the structure and performance with respect to ring yarn.
Other Spinning system: Self twist, twistless, warp spinning, Air-Vortex spinning, Electrostatic spinning, Core spinning, Siro spinning, Bobtex yarn manufacture, solo spun yarn manufacture. New Developments.
Structure and properties of different types of yarns.

Ref.Books

1. Salhotra K R and Ishtiaque S M, Rotor Spinning: Its advantages, limitations and prospects in India, 1st Ed; National Information Centre for Textile and Allied Subjects, 1995.
2. Klein W, Manual of Textile Technology: New Spinning Systems, 1st Ed; The Textile Institute, Manchester, UK 1993.
3. Lawrence C A, Fundamentals of Spun Yarn Technology, 1st Ed; CRC Press LLC, Florida, USA (2003)
4. Chattopadhyay R and Ishtiaque S M, Advances in Yarn Manufacturing Process, Department of Textile Technology, IIT Delhi 1991

BTTE-806 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

a) Shuttless Weaving by Svaty & Talavasek.

b) Modern Weaving by R.B.Gupta

c) Non-Woven Bonded Fabric by Lulenschloos

d) Non-Woven by BTRA

BTTE-808 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. Figured 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:-

1) Advance Watsons Textile Design & Colour by Watson (1989 Butterworth Co. & Publishers Ltd.0
2) Grammer of Textile by Nisbeth, 1994
3) Principles of weaving by Mark & Robinson (1976 Textile Institutemanchester)

BTTE-809 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 pre-treatment viz. Singeing, desizing, scouring, bleaching, mercerization. Optimised dyeing parameters for dyeing for printing of different 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. Standardisation of instruments/machineries, analysis of colour to check impurity percentage, evaluation of chemicals to check their efficiencies.

Ref.Books

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

BTTE-811 GARMENT MANUFACTURING TECHNOLOGY.

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

Objectives: Garment making the process which converts the fabric into a product which a person can directly use it. This course gives inputs to the students regarding the various process used in the garment production.
Prerequisites: F M, YM, Knitting, PCT

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 :-

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

BTTE-812 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:-

Marketing Management by Philip Kotler
Financial Management by I.M.Pandey

BTTE–813 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 environment :

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

Air Pollution:

Definition 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:

Definition & 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.

Process Control in Weaving by ATIRA
Process Control in Spinning by ATIRA
Industrial Engg.and Management by O.P. Khanna
Management of Textile Industry by Dudeja V D

BTTE-810 Human Resource Management

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

Introduction: Definition, Nature, Scope, Importance; HRM functions & its relation with other managerial functions; changing environment of HRM; future challenges for HRM.

Procurement: Job Analysis: Job description and job specification; Need for human resource planning; Process of Human Resource Planning; Methods of recruitment; Techniques and types of psychological tests and interviewing; Meaning and importance of Placement and Induction.

Development: Difference between Training and Development; Types of Training; Executive Development; Promotion: merit v/s seniority; Performance Appraisal: Traditional and Modern methods; Meaning of Career Planning and Development; Career anchors; Career paths for various types of jobs; Problems in career Planning and Development.

Compensation: Job satisfaction and its importance; Motivation and its theories: Maslow's, Herzberg's and Vroom's theories of motivation; Job Evaluation; Factors affecting compensation policy; Wage and salary administration.

Integration: Human relation and Industrial relations; Industrial disputes: causes, effects and machinery for settlement of industrial disputes; Trade Unions: Functions and weaknesses; Collective Bargaining: concept, Importance and process; Workers participation in management; Discipline and Grievance Procedure; Labour Turnover: causes and control; Absenteeism: causes and control.

Maintenance and Separation: Employee's -safety, Health and welfare; Accidents-causes and their prevention; safety provisions under factory act 1948; Fringe and retirement terminal benefits.

Ref. Books

1. T N Chhabra 'Human Resource Management', Dhanpat Rai & Co.
2. C B Mamoria ' Personnel Management', Himalaya Publication House.
3. Lowin B Flippo 'Principles of Personnel Management', Mc Graw Hill.
4. Mathis Jackson ' Human Resource Management (10th edition)' Thomson.

*Seminar and Industrial Visit

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BTTE-814 MAJOR PROJECT

Internal Marks: 90 **L T P**
External Marks: 60 **0 0 8**
Total Marks : 150

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.