THIRD YEAR B.TEXT. – SEMESTER - I

5.1 TEXTILE ELECTRONICS – I (TT/MMTT/TPE/TC)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Subject Total	:	150 Marks

1) Electronics Components

Electronics components, passive components, resistors, color coding of resistors, variable resisters, capacitors, color code used for capacitors, variable capacitors, inductors.

2) Semiconductors

Semiconductor materials, metals, insulators semiconductors, intrinsic semiconductor, extrinsic semiconductors, p-n junction diode, junction theory, VI characteristics of p-n junction diode, use of diode in rectifiers, half wave rectifier, full wave rectifiers, performance of rectifiers, filters-shunt capacitor filter, series inductor filter, filter, LC filter, zener diode, zener regulator, diode specification.

3) Transistor

Junction transistor structure, working of transistor, relation between different currents in a transistor, transistor amplifying action transistor configurations, transistor characteristics (More emphasis CE configuration). Basic CE amplifier transistor data sheet, transistor testing.

4) Op-Amp

Introduction, block diagram, symbol, ideal op-amp, open loop
op-amp configuration, Concept of feedback in amplifier, op-amp with negative feedback, IC741-pinout and specifications, applications.

5) Power Semiconductor Devices and Applications

SCR construction Principle of operation, two transistor analogy, turning ON and OFF of SCR, SCR characteristics, Triac- Construction, working and characteristics, diac-construction, working and characteristics, UJT -

Construction, working and characteristics. UJT as Relaxation Oscillator, Application of SCR – Single Phase Half Wave Controlled Converter, SCR in DC Motor speed control. AC power control using triac

6) Optoelectronic Devices

Classification of optoelectronic devices- emitters, sensors, optocouplers, LED, photodiode, phototransistor, LDR, photo voltaic cell, application of optoelectronic devices in textile

7) Transducers

Transducer classification – Primary and secondary transducers, active and passive transducers, analog and digital transducers, advantages of electrical transducer, Basic Requirements of a transducer

Pressure measurement – Diaphragm bourdon tube Bellows.

Temperature Transducers – Resistance temperature Detector (RTD), Thermocouple, Thermisters

Strain Measurement – Introduction, factor affecting strain measurement, types of strain gauge, Theory of operation of resistance strain gauge, types of electrical strain gauge, properties of strain gauge, materials for strain gauges, electrical strain gauge, properties of strain gauge, materials for strain gauges,

Linear variable differential transformers (LVDT),

Capacitive transducers, Piezo electric transducers.

Note: Emphasis should be given on applications of above transducers in textile industry

8) Electromechanical Devices

Electromagnetic relay, Reed relay, Solenoid valve, Limit switches.

9) Introduction to Digital Electronics

Difference between digital and analog electronics, digital gates, Working, truth table and Boolean equation, with examples from TTL family.

List of Experiments:-

1) Forward and reverse bias characteristics of diode.
2) Half wave rectifier (with and without filter).
3) Full wave rectifier (with and without filter).
4) I/O characteristics of transistor in CE configuration
5) Op-amp inverting and non-inverting amplifier.
6) UJT characteristics
7) Study of AC power control using triac.
8) LDR characteristics.
9) Speed measurement using optical and magnetic pickups.
10) Study of RTD and thermister characteristics.
11) Study of strain gauge characteristics.
12) Study of LVDT characteristics.
13) Study of inductive and capacitive pickup.
14) Study of SCR characteristics
15) Study of basic gates.

Reference Books :-

1. Basic Electronics and Linear Circuits by N.N. Bhargava, D.C. Kulshreshtha TMH Pub.
2. Electronic Devices and Circuits by Allen Mottershade, PHI Pub.
3. Modern Industrial Electronics by T.J. Maloney. Fourth Edition, Prentice Hall Pub.
4. Electrical and Electronics Measurements and Instrumentation by A.K. Sawhey, Dhanpat Ria and Sons Pub.
5. Instrumentation Devices and Systems by C.S. Rangan, G.R. Sharma, TMH Pub.
6. Electronics Components and Materials by Madhuri Joshi
7. Op-amp and Linear Integrated Circuits by Ramakant Gaykwad.
8. Thyristor and their Applications by Ramamurthi
9. Digital Principles and applications by Malvino and Leach.

THIRD YEAR B. TEXT - SEMESTER-I

5.2 YARN FORMING TECHNOLOGY-IV (TT)

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Ring Spinning:-

a. Objects and principle of operation. Study of passage of material through the machine – structural configuration of the machine. Driving arrangement and calculation regarding production and twist.

b. Creel : Function, importance, study of conventional and modern creels.

c. Drafting System : Function, importance, arrangement of drafting assembly (evolution of the design of drafting systems on the ring frames), conceptual structure of the drafting system – The top rollers and bottom rollers – construction, types function and maintenance.

   Top arm roller weighting system – study of weighting options – spring pneumatic, magnetic – Fibre guiding devices – long and short aprons, cradles, concept of e-drafting.

d. Spindle : Function, Importance, general construction of a spindle, design developments in spindles used on ring frames, spindle bearings, influence of spindle on the spinning process.

e. Drives – (A) Spindle drive – Types of drives used to drive spindles – (i) tape drive, (ii) tangential belt drive, (iii) direct drive, concept, design in working merits and demerits of each type.

   (B) Drive to machine – single motor, dryal motor, variable speed (mechanical, electronically controlled and inverter) drive – design features, operating principle and merits and demerits of each.

f. The thread guide devices : Function, importance, types (fixed, rising and falling) settings.

g. The balloon control ring and the separator function, importance design features and settings.

h. Ring and Traveller : The function and importance of ring and travelers.

A) Ring :

a) Ring shape – Standard, T flanged single and double sided, anti-wedge, SV ring, Indined flanged, enlarged and reduced etc.

b) Ring material, brief note on ring manufacture.

c) Methods of mounting ring on ring frame.

d) Flange width and number, ring diameter – importance and specifications.

e) Fibre lubrication on the ring

f) Running in of new rings

B) Traveller:

a) Task and Function

b) Traveler shape and its applications

c) Traveller mass and its importance

d) Materials used per Travellers

e) Traveller wire profile

f) The traveler clearer

i. Cop Building : Cop shape the winding process. The building mechanism, forming the base, motor powered cop formation.

j. Automation in Ring Frame : Need, the potential for automation, concept and principle of operation of auto doffing, merits and demerits inter connected transportation.

k. Monitoring of Ring frame Operation : The objective ring data, individual spindle monitoring (ISM), mill information systems.

l. Ancillary Equipment :

a. Fibre extraction system (pneumafil) concept, importance, principle of operation.

b. Travelling Cleaners – The problem of dust and fly, types of travelling cleaners, construction and working.

m. Compact Spinning : Basic problem of hairiness of yarns on conventional, Ring frame – Solution to the problem, implementation of the basic solution, Advantages of condensing.

Types of compact spinning systems used, their merits and demerits. Comparison of compact yarns and conventional ring spun yarns.

n. The spinning Geometry – Terms used (a) The spinning triangle, formation, dimensions and its influence on end breakage and yarn structure (b) The spinning length (c) Spinning angle (d) Roller over han (e) Other dimensions in spinning geometry.

o. Yarn Tension in Spinning : Concept and importance, tension variations during spinning – factors affecting tension in yarn, balloon theory. End breaks in ring spinning – importance and mechanism of end breaks, factors affecting end breaks.

p. Selection of ring frame specifications depending on count and material being processed. Defective production of ring frame and remedies. Routine maintenance schedule of ring frames Relative Humidification requirement and its importance.

Yarn Folding and Doubling:-

1. Object of ply twisting - Scope of ply twisting - Methods of ply twisting, concept of balance of twist.
2. Study of conventional Ring doubling machines. calculation relating to production, efficiency and twist – Limitation of ring doubling system
3. Study of Two For One Twisters – evolution of TFO, basic concepts, study of design and construction of two for one twisting machine. Machine design aspects, drives used, power requirement, calculations relating to efficiency, production and twist. Advantages over ring doubling. Techno economics. Modern developments in TFO machines.
4. Fancy yarn production – classification of fancy yarns - basic principle - study of productions methods - spinning techniques for the production of fancy yarns – Design and construction of the basic profiles such as Spiral, Gimp, Loop, Snarl, Knop, Cover, Slub, Chenille, Marl, Grandrelle, Nepp. Combination of profiles – analysis of fancy yarns.
5. Production and preparation of Melange yarn, Lycra, Elastane yarns, Singed yarn etc.

List of Experiments:-

1. Ring frame settings – Spindle gauging, lappet guide centering, spindle centering, etc.
2. Study of building mechanism of ring frame.

3. Study of TFO – passage, gearing, calculations related to twist, speed, production.
4. Study of Ring-doublers – passage, gearing, calculation related to twist, speed and production.
5. Measurement of various parameters related to spinning geometry of different ring frames.
6. To study the Pneumatic circuits used in spinning, and drives to ring frame
7. Manufacture of package on soft/parallel winding machine at various process parameters.
8. Production of slub yarns and other fancy yarns by using Fancy yarn making device.
9. Manufacture of multi-twist and multi-count yarn.
10. Production of compact yarn and comparison of the same with ring spun yarn.
11. Mill visit–Study of Modern Ring frame, Yarn conditioning /Packaging, TFO, etc.

Reference Books:-

1) Fundamentals of Spinning – P. Lord / C. A. Lawarance
2) Technology of Cotton Spinning – J. Janakiram
3) Trade Literature and Bulletins of Rieter LMW, Marzoli
4) NCUTE Pilot programmes in spinning.
5) SITRA Focus series.
6) Elements of ring frame and doublings by A. R. Kahre.
7) Manual of Textile Technology – Short Staple Series.
8) Vol IV A Practical Guide to Ring Spinning – W. Klein
9) Advances in Spinning – S. M. Ishtiaque
10) Two for one Twister technology and Technique for spun yarns by H. S. Kulkarni and HVS Murty.

THIRD YEAR B. TEXT. - SEMESTER- I

5.3 FABRIC FORMING TECHNOLOGY- IV (TT)

Lectures	:	4 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1. **High Speed Shedding Mechanism :-**

a. Limitations of Tappet shedding motion, positive cam shedding concept and need, Positive cam shedding motions, constructional and working details (Ruti-C, Projectile, Rapier and Air jet), Adjustments essential during weave change and timing. Mounting possibilities, pitch of heald frames.

b. Limitation of lever and cam negative dobby, positive lever dobby, positive rotary cam concept, Rotary mechanical and electronically controlled dobby, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.

c. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, adjustment for various weaves, Jacquard capacity, mounting, suitability for various end uses, data transfer and management, Networking with looms

2. **Air Jet weft Insertion: -** Machines for air jet weaving, Introduction, overview of weft insertion elements, main nozzle designs, relay nozzle designs, stretch nozzle design. Configurations, loom timing of picking elements and settings, constructional details of profile reed. Air supply and energy consumption, Air flow in nozzles and guide channel, performance of yarns in air jet insertion, Optimization of settings, Weft stops and breaks, application of air jet weaving. Drive, Pneumatic circuit for air supply. Technical features of modern air jet weaving machines, (Dornier, Smit, Picanol, Sulzer) Quality of Air, Maintenance of machines. Quick Style Change.

3. **Water Jet Weft Insertion: -** Introduction, Design requirements, Picking mechanism, weft insertion elements, loom timing and settings, features of water jet looms, applications of water jet weft insertion system. Comparison with air jet, maintenance. Technical features of modern water jet weaving machines, (Nissan, Tsudokoma, Inventor). Comparison of various shuttle less weaving technologies with respect to reed width, loom speed, WIR and capital cost.
4. **Multiphase Weaving:**- Introduction, Classification, Methods to form warp wise and weft wise sheds, methods of picking, methods of beat up, limitations of multiphase weaving, applications, features of modern multiphase weaving machines e.g. M 8300, maintenance.
5. **Circular Weaving:**- Introduction, Classification as per number of shuttles, shedding, picking, beating, cloth collection, supply of warp yarn, stop motions for warp and weft, productivity, Maintenance. Technical features of Circular weaving machines, (Sterlings, Lohiya)
6. **Other Unconventional Weaving Methods :**

Triaxial Weaving: - Structure and Properties of triaxial woven fabrics, applications, weaving equipment for triaxial weaving.

Narrow Fabric Weaving*:-*

a. Introduction, Scope of narrow fabric weaving, applications
b. Preparation – Machines and processes for assembling warps, various warping processes used, weft preparation.
c. Technology of narrow fabric weaving – Machine construction, Shuttle looms, needle looms, warp feed systems from beams, creel for elastomeric yarns, shedding by cam and links, pattern chain preparation for different weaves, weft insertion systems(needle loom) , various selvedge forming systems on needle loom, drives to different elements, take up.
d. Application of weaves in narrow fabric weaving.

Manufacture of Labels*: -* Applications, labels with woven selvedge and cut selvedge. Printed labels, fabric specifications, specifications of jacquard used, feed material specifications.

Braiding*:* - Introduction, classification (rounds and flat braids), applications, raw material used for braids, machines used for braiding (drive, yarn supply, Braiding technology, take up.)

7. **Nonwovens :-**

   Definition, classification according to raw material and method of production, Comparison of productivity with other technologies, Raw material used, process flow for manufacturing various non-woven techniques, introduction to web forming and bonding methods.

8. **Geo Textiles:-** Definition, classification, Raw materials, functions and area of application.

List of Experiments:-

1. Overhauling of Sulzer picking motion.
2. Study of style change process on projectile (Sulzer) Machine.
3. Study of let-off motions of all shuttle less weaving machines and operations of looms.
4. Study of control panel of Dornier weaving machine and fabric production with changed parameters.
5. Study of style change, control panel of SMIT Air Jet weaving machine and fabric production with changed parameters.
6. Study of Dobby CAD software
7. CAD software application – Creation of weaves
8. CAD software application – Creation of weaves.
9. Study of style change on Dornier
10. Study of sample weaving equipment
11. Visit to rapier weaving unit.
12. Study of needle loom technology, Braiding machine Technology and production of fabric on them
13. Visit to circular loom unit

Reference Books:-

1. Handbook of weaving – Sabit Adanur.
2. Modern preparation and weaving machinery – A Ormerod
3. Shuttleless Looms – J. J. Vincent
4. Shuttless weaving machine – O. Talavasele, V. Svaty
5. Narrow Fabric Weaving - Sauer Lander Verlag
6. Narrow Fabric Group Conference – Textile Institute
7. Braiding and Braiding Machinery – W. A. Douglass
8. Manual of Nonwoven by Dr. Radko Krima.
9. Geo-textiles by N.W.M. John.

THIRD YEAR B.TEXT. - SEMESTER - I

5.4 CHEMICAL PROCESSING OF TEXTILES-II (TT/MMTT)

Lectures	:	3 hrs/week.
Practicals	:	2 hrs/week.
Theory Paper	:	100 marks.
Term Work	:	25 marks
Practical Exam.	:	50 marks
Subject Total	:	175 marks.

1. Elements of Dyeing – Principles of dyeing, Classification of dyes based on the method application, dye fibre interactions and concepts like exhaustion, expression, percentage shade , affinity and substantivity.
2. Dyeing of cellulosic fibres with direct, vat, reactive and sulphur dyes.
3. Dyeing of silk, wool, acrylic, and nylon.
4. Dyeing of Polyester and its blends like polyester-cotton, polyester-viscose, polyester-wool.
5. Evaluation of fastness properties like wash fastness, rubbing fastness and light fastness
6. Introduction to Loose fibre dyeing machines, package dyeing machine. Jigger dyeing machines, winch dyeing machine, padding mangles, jet dyeing and soft flow dyeing machines.
7. Concept of printing. Various ingredients used in preparation of printing paste.
8. Various styles of printing such as Direct, Resist and Discharge by using direct, reactive and disperse dyes.
9. Printing with pigments.
10. Introduction to various methods of printing such as table, flat bed and rotary screen printing.
11. Concept of inkjet / digital printing.
12. Objects of finishing, classification of finishes. Resin finishing, mechanism of resin finishing. Concept of anti crease, wash-n-wear and durable press.
13. Heat setting and weight reduction of polyester material.

14. Concept of specialty finishes like soil release, water repellent and flame retardant finishes.
15. Various finishing machinery such as stenter, calendars, sanforising and drying machine.

List of Experiments :-

1. Dyeing of cotton with various classes of dyes such as direct, vat, reactive, and sulphur.
2. Dyeing of wool and silk with acid and metal complex dyes.
3. Dyeing of 100% polyester with disperse dye by using HTHP beaker dyeing machine.
4. Dyeing of polyester-cotton blends.
5. Demonstration of dyeing of cotton on Jigger, Padding mangle, Package dyeing, soft flow dyeing machine and garment dyeing machine.
6. Printing of cotton with pigments.
7. Printing of cotton with reactive dyes for direct and discharge style.
8. Chemical identification of fibres.
9. Chemical identification of dyes on fibres.
10. Evaluation of light, washing and rubbing fastness.
11. Demonstration of computer colour matching system

Reference Books:-

1) Dyeing Of Polyester and Its Blends by M.L. Gulrajani.
2) Dyeing Of Chemical Technology Of Textile Fibres by E.R. Trotman.
3) Technology Of Dyeing by V.A. Shenai.
4) Textile Printing by L.W.C. Miles.
5) Technology Of Printing by V.A. Shenai.
6) An Introduction To Textile Printing by W. Clarke.
7) Textile Finishing by A.J. Hall.
8) Introduction To Textile Finishing by J.T. Marsh
9) Technology of Finishing by V.A. Shenai.

THIRD YEAR B. TEXT - SEMESTER-I

5.5 STRUCTURE AND PROPERTIES OF TEXTILE FIBRES (TT)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

1. Fibre structure-Requirements of fibre formation - Molecular weight - Molecular weight distribution, Determination of molecular weight, Molecular weight distribution curves, Degree of polymerization - useful limits of polymerization- crystalline and amorphous regions - molecular structure of fibres-Morphological models-one phase, two phase, three phase models - Morphology of various fibres.
2. Techniques for investigation of fiber structure
   a. Optical properties of textile fibres- Refractive Index- Double refraction, Birefringence. Optical heterogeneity in fibres-The factors influencing the birefringence of a fibre, Measurement of birefringence - Beckeline method-Compensator method - Interference microscopy - Refractometer method-Significance of birefringence, Optical dichroism and its importance.
   b. X-ray Diffraction Investigations-Introduction, Production and origin of X-rays-Bragg's law of x-ray diffraction-crystal structure-miller indices-determination of fibre structural parameters by x-ray diffractometer and fibre diagram techniques-small angle scattering.
   c. Electron Microscopy – Principle of electron microscope- Transmission and scanning electron microscope - Principle, working and applications.
   d. Infrared Spectroscopy – Spectroscopy, Beer-Lambert law, Principles of IR-Spectroscopy, Principle and working of IR spectrophotometer, Applications, IR-Dichroism and its importance.

3. Mechanical Properties of Textile fibres
   a. Tensile properties-Terminology, the factors influencing the tensile properties of fibres
   b. Effects of variability- variability –weak link effect, Pierces formula-derivation- Spencer Smith theory, Composite specimen effects-variability in practice
   c. Elastic recovery-Definitions-Effects of test conditions on elastic recovery of fibres- Mechanical conditioning of fibres-swelling recovery
   d. Forces in various directions-bending and twisting of fibres, derivation of flexural and torsional rigidity, shear modulus-shear strength-general elastic deformation-compression

e. Theories of Mechanical Properties-approaches-structural effects in fibres-theories of time dependence-thermodynamic effects-creep stress relaxation, stress-strain curve, dynamic mechanical properties, their measurement and importance.

4. Model theory of visco-elasticity-linear visco-elasticity, visco-elastic models-Features of Eyring model.
5. Fibre Friction- Consequence of friction in textiles, measurement of friction-empirical results-the nature of friction.
6. Thermal properties-Introduction-Specific heat capacity, thermal conductivity, structural changes in fibres on heating and setting, Transition in fibres-primary and secondary transitions and their significance, factors influencing them, degradation and decomposition, Thermal expansion of fibres.
7. Electrical properties: Static electricity-its generation and consequence-measurement of static electricity, Dielectric properties-permittivity, dielectric constant, dissipation factor, power factor, factors influencing the dielectric properties, measurement of dielectric behavior of fibres, Electric resistance-Specific resistance- Measurements of resistance-Factors influencing the electrical resistance of fibres.

List of Experiments:-

1) Cutting combing ratio of carded and combed sliver.
2) Moisture absorption of sliver, roving and yarns.
3) Torsional rigidity of natural fibre/man made fibre.
4) Determination of SCI by HFT 9000.
5) Study of fibre parameters by AFIS.
6) Fibre bundle tenacity by Stelometer.
7) Determination of neps and length by Aquara.
8) Hot air and Hot water shrinkage testing of cotton, blended filament fabrics
9) Determination of fibre density.
10) Determination of single fibre strength.
11) Study of creep and stress relaxation of spun yarn.

Reference Books:-

1. Fibre Science- Edited by J.M. Preston, Published by the textile institute, Manchester
2. Physical Methods of Investigation of Textiles, Edited by Meredith R. and Hearle J.W.S.-Published by Textile Book published Inc. New York
3. Physics of fibres- An Introductory Survey-Woods H. J. Published by the Institute of Physics-London, 1955
4. Applied Fibre Science- Vol I-Edited by F. Happey published by Academic Press, London
5. Physical Properties of Textile Fibres-Morton W. E. and Hearle J.W.S. published by the Textile Institute Manchester
6. Fibre Microscopy-Stores J. L. published by London National Trade Pr
7. Structure/Property relationship in Textile Fibres-Textile Progress Vol. 20, No. 4 The Textile Institute Manchester
8. Textile Fibres Yarns and Fabrics – Kaswell E. R. published by Reinhold Publishing Corporation- New York, 1954.

THIRD YEAR B.TEXT. - SEMESTER - I

5.6 MECHANICS OF TEXTILE MACHINES (TT/MMTT)

Lectures	:	3 hrs/week.
Theory Paper	:	100 marks.
Sub. Total	:	100 marks

1. Frictional Drives :-

Introduction, Frictional drive to cheese and cone, Belt drives –Basics, Conditions of critical slippage of belts – maximum power condition, texturising by belt and friction disc, the timing belt drive, cone drum belt drives.

2. Positive Drives :-

Chain and sprocket drive - Gear drives – types of gears – terms used in study of gears – pitch measurement, ratio of gear trains – features of change wheels, Epicyclic gear trains – velocity ratio – differential gearing in comber and Speed frame. Planetary mechanisms in Coiling.

3. Intermittent Rotary Motion :-

Introduction – Ratchet and pawl mechanisms – Let off and take up motions in weaving machines – variation in pick spacing – Geneva wheel.

4. Cams and Eccentric: -

Introduction – Basic types of cams, types of followers, Motion of cam follower – Displacement, Velocity and Acceleration diagrams for linear, S.H.M., uniform acceleration and retardation cams. Uses of linear cam, positive cams, conjugate cams, Cylindrical Cam in Textile machines. Eccentric and its uses.

5. Linkage Mechanisms :-

Introduction – The four bar linkage, its geometry– Equations of Displacement, Velocity and Acceleration of a point, SHM, calculation of dwell clearance on a loom with linear cam, SHM and modified SHM, Sley eccentricity, Multiple Bar Linkage – Double Beat up mechanism, Combined ratchet and linkage mechanisms, complex combined mechanism – driving of detaching rollers of comber.

6. Balancing of Machines :-

Introduction, Vibrations of machine, Balancing of machinery – Unbalance and its causes, Production balancing, Field balancing, Theoretical considerations in balancing – Static and Dynamic balancing, Various cases of balancing, Numerical examples based on different cases. Balancing of rotor, Cards cylinder and practical aspects of balancing. Measurement and control of unbalance- Static and Dynamic balancing machines.

7. Clutches and Brakes :-

Introduction – Clutches – Jaw / toothed clutches, Friction clutches, Materials for friction lining, Cone Clutches. Torque and power transmission capacity of clutches. Numericals.

Brakes - Classification of brakes, Constructional details of band, block and differential brakes, braking torque, Internal expanding brake, Application of brakes in Textile machines. Numerical examples

8. Selection Mechanisms :-

Introduction – methods of storing information – the grouping of machine parts for selection – converting information into movement – some mechanical switching mechanisms – Dobby selection mechanisms – high speed mechanical switching mechanisms – additional complex mechanical switches – the movement of the information store.

9. Control Mechanisms :-

Introduction – the elements of control mechanisms, open loop and closed loop system –Detection of broken ends, control of yarn tension and cloth tension, detection of full and empty packages.

10. Mechanics of Spinning and Weaving Machines :-

Construction of Beater and Chamber, Inertia of Carding, Card Wires, Drafting force and friction field in roller drafting, coils spacing in speed frame, Centrifugal force of flyers, Arrangement in two rows, Yarn tension in ring spinning, Balloon theory,

Study of mechanisms in winding, Build of various packages. Screw traversing mechanism. Design of grooved drums for various packages. Design changes in Beam warping drive for high speed. Sectional warping drum design. Mechanism of squeezing, sow box design. Review of design changes of shedding mechanism. Picking mechanism theories for different shuttleless weaving techniques.

Reference Books :-

1) Textile Mathematics, Vol-I By J.E. Booth, The Textile Institute, Publication.
2) Textile Mathematics, Vol-II By J.E. Booth, The Textile Institute, Publication.
3) Textile Mathematics, Vol-III By J.E. Booth, The Textile Institute, Publication.
4) Control Methodology in Textile Engineering and Economics By John W.s. Hearle, Journal of the Textile Inst. Vol.83, No.3, 1992, The Textile Institute Publication
5) Mechanics for Textile Students, By W.A. Hanton, The Textile Inst. Pubication.
6) Mechanics of Spinning Machines By R.S. Rengasamy, NCUTE Publication
7) Textile Mechanics Vol.I, By K. Slater, The Textile Inst. Publication.
8) Textile Mechanics, Vol.-II, By K. Slater, The Textile Inst. Publication.
9) An Introduction to Textile Mechanisms By P. Grosberg, The General Publishing Company.

THIRD YEAR B. TEXT - SEMESTER-I

5.7 INPLANT TRAINING - I (TT/MMTT/TPE/TC/FT)

Duration : 4 Weeks

Term Work : 50 Marks

Objective:

To provide an opportunity to observe industrial activities and gather related technical and non-technical information about industry working.

Training Period:

Four weeks after completion of second semester of Second Year B.Text.

Industry:

Spinning, Weaving, Garment, Processing, Synthetics, Textile Chemicals and Auxiliaries, R & D, Machinery Manufacturing, Marketing etc. as per the course

Observations:

Observe working of industry and collect data as per guidelines in the daily diary, manual, study machineries / systems / practices.

Training Report:

Report should be prepared as per following guidelines and submitted for evaluation -

* Report should have Title on Cover of Report as per Format.
* Report should be prepared as per following sequence -

I Page Certificate from Institute as per Format.
II Page Acknowledgement
III Page Programme of Training
IV Page Introduction of Industry
V Page Index with Page Numbers
VI Page Plant/Dept. Layout
VII Page Organizational Structure.
VIII Page Department wise/Product wise Report

(This report should be based on Own Observations made, data collected during Inplant Training (i.e. Study of Machinery, Actual Production and Efficiency, Production Control, Modern Developments in Machines/Process, Flow Chart of Processes, Speed of Important Parts, Labour Allocation, Maintenance Practices, Process Control and Quality

Control Activities etc.) roles and responsibilities of various Workers/Technical Staffs'

Special Study: Mini Project Undertaken, Costing, Production Planning and Control, Target Achievement, Information regarding humidification plant, Utility, Electrical Supply, Store, Purchase, Marketing, Sales, Samples, Lay-out of Mill etc.)

Assessment:

Viva-voce to be conducted in first semester of Third Year B.Text. Term Work Marks are assigned on the basis of student's performance in viva-voce, conducted by internal / external examiners having industrial experience.

THIRD YEAR B. TEXT - SEMESTER-I

5.2. TEXTURISING & BLEND SPINNING (MMTT)

Lectures	:	4 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

TEXTURISING:-

Draw backs of flat filament yarns, Definition and concept of texturising, Classification and characteristics of textured yarns.

False Twist Texturising:- scientific principle in twist texturising, Methods of production of stretched(single heater) and modified stretched (double heater) yarns by conventional methods.

Draw Texturising concept, sequential and simultaneous draw texturising, Study of simultaneous draw texturising process. Draw Texturising Machine Details: - Machine profiles, Twisting devices, Heaters, Cooling devices, Coning oil application, Process variables, Defects in draw textured yarns. Quality of draw textured yarns. Technological developments in draw–texturising technology. Double density machine and multiple input shaft machines,

Air Jet Texturising:- Principle of loops formation, Air-jet texturising machine, air- jets, wetting systems, stabilizing devices, process variables in air texturising, Quality of air textured yarns, blending of filaments in air texturising.

Other methods of texturising:-

BCF Processes and Yarns: - BCF draw texturising machines, process variables.

Edge crimping, Stuffer box crimping, Knit-de-knit, Gear Crimping, Chemical Texturising.

BLENDS SPINNING:-

Fibre characteristics and spinnability, fibre properties and end uses, objectives of blending, measures of blending, migration, tinting, selection of blend constituents, and mechanics of blending, blending techniques, and modification of cotton spinning machineries for processing of manmade fibres. Prediction of blended yarn strength.

Common faults in blended and 100% man made spun yarn. Blending of manmade fibres with wool and problems in processing of long staple fibres. Processing of manmade fibres and its blends on Rotor Spinning Machines. Blended yarns production using air-jet spinning.

Spinning of dyed fibres, Requirements for spinning of dyed fibres.

Winding and doubling of blended spun yarns.

List of Experiments:-

1) Demonstration of draw texturising machine (Himson HDS-CX_2).
2) Effect of various processing parameters of draw texturising (Himson HDS-CX_2) on Structure and properties of textured yarns.
3) Comparison of properties of draw textured yarns manufactured by using single heater and double heater.
4) Demonstration of Himson HJT-1000 Air-jet texturising machine.
5) Effect of various processing parameters of Air-jet texturising (HJT-1000) on structure and properties of air-jet textured yarns.
6) Production of blended filament yarn using air-jet texturising machine and study the properties of blended filament yarn.
7) Effect of various processing parameters of high speed Himson draw winder on characteristics of drawn filament yarns.
8) Demonstration of Crepe-TFO machine.
9) Demonstration of Air covering machine and manufacturing of Elastic Air covered yarn.
10) Effect of various processing parameters of Air covering machine on the structure and properties of air-covered yarns.
11) Visit to the texturising plant.
12) Visit to filament yarn twisting unit.

Reference Books:-

1) Yarn Texturing Technology by J.W.S. Hearle, L. Hollick, D.K. Wilson Woodhead Publishing Ltd, England.
2) Textile Yarn, Technology, Structure and Application" – Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Interscience publication, 1977, U.S.A.
3) Wilson D.K. and Kollu T., "Production of Textured Yarns by the False Twist Technique", Textile Progress, Vol. 21, No.3, Textile Institute, Manchester, U.K.,1991.
4) Wilson D.K. and Kollu T., "Production of Textured Yarns by Methods Other than False Twist Technique", Text. Prog., Vol. 16, No.3. Textile Institute, 1981.
5) Gupta V.B. (Edr.), "Winter School on Man-made Fibers – Production, Processing, Structure, Properties and Applications", Vol. 1, 1988.
6) Hes L. Ursiny P., "Yarn Texturing Technology", Eurotex, U.K., 1994.
7) M. Acar and G.R. Wray., "An analysis of the air jet yarn texturing process Part-I: A Brief history of developments in the process", Journal of Text. Institute, Vol.77,No.1, p19-27, (1986).
8) K R Salhotra , "Spinning of man made fibres and blends on cotton systems", The textile Association, India 2004.
9) Hamburger, W. J., "The Industrial Application of the Stress-Strain Relationship", J. Textile Inst. 40, 700 (July 1949).

THIRD YEAR B. TEXT. - SEMESTER-I

5.3 MANMADE FABRIC MANUFACTURE- IV (MMTT)

Lectures	:	4 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1. **High Speed shedding mechanism :-**

a. Limitations of Tappet shedding motion, positive cam shedding concept and need, Positive cam shedding motions, details of construction and working (Ruti-C, Projectile, Rapier and Airjet), Adjustments essential during weave change and timing. Mounting possibilities, pitch of heald frames.

b. Limitation of lever and cam negative dobby, positive lever dobby, positive rotary cam concept, Rotary mechanical and electronically controlled dobby, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.

c. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, adjustment for various weaves, Jacquard capacity, mounting, suitability for various end uses, data transfer and management, Networking with looms

2. **Air Jet weft Insertion: -** Machines for air jet weaving, Introduction, overview of weft insertion elements, main nozzle designs, relay nozzle designs, stretch nozzle design. Configurations, Loom timing of picking elements and settings, constructional details of profile reed. Air supply and energy consumption, Air flow in nozzles and guide channel, performance of yarns in air jet insertion, Optimization of settings, Weft stops and breaks, application of air jet weaving. Drive, Pneumatic circuit for air supply. Technical features of modern air jet weaving machines, (Dornier, Smit, Picanol, Sulzer) Quality of Air, Maintenance of machines. Quick Style Change.

3. **Water Jet Weft Insertion: -** Introduction, Design requirements, Picking mechanism, weft insertion elements, loom timing and settings, Features of water jet looms, applications of water jet weft insertion system. Comparison with air jet, maintenance. Technical features of modern water jet weaving machines, (Nissan, Tsudokoma, Inventor) Comparison of various shuttle less weaving technologies with respect to reed width, loom speed, WIR and capital cost.
4. **Multiphase Weaving:**- Introduction, Classification, Methods to form warp wise and weft wise sheds, methods of picking, methods of beat up, limitations of multiphase weaving, applications, features of modern multiphase weaving machines e.g. M 8300, maintenance.
5. **Circular Weaving:**- Introduction, Classification as per number of shuttles, shedding, picking, beating, cloth collection, supply of warp yarn, stop motions for warp and weft, productivity, Maintenance. Technical features of Circular weaving machines, (Sterlings, Lohiya)
6. **Other Unconventional Weaving Methods :**

Triaxial *Weaving:* - Structure and Properties of triaxial woven fabrics, applications, weaving equipment for triaxial weaving.

Narrow Fabric Weaving:-

a. Introduction, Scope of narrow fabric weaving, applications
b. Preparation – Machines and processes for assembling warps, various warping processes used, weft preparation.
c. Technology of narrow fabric weaving – Machine construction, Shuttle looms, needle looms, warp feed systems from beams, creel, for elastomeric yarns, shedding by cam and links, pattern chain preparation for different weaves, weft insertion systems(needle loom) , various selvedge forming systems on needle loom, drives to different elements, take up.
d. Application of weaves in narrow fabric weaving.

Manufacture of Labels*:* - Applications, labels with woven selvedge and cut selvedge. Printed labels, fabric specifications, specifications of jacquard used, feed material specifications.

Braiding*:* - Introduction, classification (rounds and flat braids), applications, raw material used for braids, machines used for braiding (drive, yarn supply, Braiding technology, take up.)

7. **Nonwovens :-**

   Definition, classification according to raw material and method of production. Comparision of productivity with other technologies. Raw material used, process flow for manufacturing various non-woven techniques, introduction to web forming and bonding methods.

8. **Geo-Textiles:-** Definition, classification, Raw materials, functions and area of application.

List of Experiments:-

1. Overhauling of Sulzer picking motion.
2. Study of style change process on projectile (Sulzer) Machine.
3. Study of let-off motions of all shuttle less weaving machines and operations of looms.
4. Study of control panel of Dornier weaving machine and fabric production with changed parameters.
5. Study of style change, control panel of SMIT Air Jet weaving machine and fabric production with changed parameters.
6. Study of Dobby CAD software
7. CAD software application – Creation of weaves
8. CAD software application – Creation of weaves.
9. Study of style change on Dornier
10. Study of sample weaving equipment
11. Visit to rapier weaving unit.
12. Study of needle loom technology, Braiding machine Technology and production of fabric on them
13. Visit to circular loom unit

Reference Books:-

1. Handbook of weaving – Sabit Adanur.
2. Modern preparation and weaving machinery – A Ormerod
3. Shuttleless weaving machine – Svaty.
4. Shuttleless Looms – J. J. Vincent
5. Shuttless weaving machine – O. Talavasele, V. Svaty
6. Narrow Fabric Weaving - Sauer Lander Verlag
7. Narrow Fabric Group Conference – Textile Institute
8. Braiding and Braiding Machinery – W. A. Douglass
9. Manual of Nonwoven by Dr. Radko Krima.
10. Geo-textiles by N.W.M. John.

THIRD YEAR B. TEXT - SEMESTER-I

5.5 PHYSICAL PROPERTIES OF MAN-MADE FIBRES & TESTING (MMTT)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

1. Testing of manufactured filament and staple fibre fineness, Testing of fibre crimp, Testing of tensile properties, Evenness, shrinkage behaviour, entanglement and frictional properties of filament yarns.
2. Dynamic thermal tester and determination of filament yarn characteristics using Dynamic thermal tester.
3. Testing of spin finish content and density of fibres/filament yarns.
4. Evaluation of characteristics of false twist textured yarn and air-jet textured yarns.

5. Sampling for determination of fibre properties - Importance, general requirements – random sample, biased sample, numerical and length biased samples, Sampling technique –Squaring method – Cut square method, Zoning techniques, Tong sampling method.

6. Longitudinal dimensions (Fibre length) - Concept, Technical Significance of fibre length, frequency, weight and length distributions, length distribution and fibre diagrams: P (l), Q (l), T (l), staple length of cotton, Fibre length measurement –Staple length - Oil plate method – Comb sorter method, Scanning method- Fibrograph.

7. Transverse dimensions

a) Maturity: - Concept, Technical significance – measures of fibre maturity –methods measurement of fibre maturity – NaOH swelling by microscope method, Polarized light method.

b) Fineness :- Concept, Terms and definitions, Technical significance of fibre fineness, Measures of fineness, measurement of fineness,

Instruments working on air flow principle like Micronaire, WIRA tester, Aeralometer.

8. Fibre strength: - Introduction, terminology, stress-strain curve and its importance, Factors influencing fibre strength, Measurement of fibre strength. Principles of tensile testing, Modes of loading- CRE, CRL, CRT, Factors affecting tensile testing ,Bundle fibre strength testing, Pendulum lever principle, Single fibre strength testing – Strain guage principle, Instruments working on these principles- Stelometer, Instron, single fibre strength v/s bundle fibre strength.

9. Study of modern fibre testing instruments such as HVI and AFIS.

10. Fibre Quality Index as derived by research institutes and its significance.

11. Moisture relations:- Introduction, terminology- measurement of atmospheric conditions- Dry and wet bulb hygrometer.

Regain:- humidity relationship- effect of regain on fibre properties, measurement of regain- correct invoice weight, moisture testing ovens, resistance and capacitance principle.

List of Experiments:-

1. Determination of fibre length parameters by Comb sorter
2. Fibre Maturity Measurement by Caustic Soda (NaOH) Method.
3. Fibre Fineness by Cut-Weight Method.
4. Determination of span length and uniformity ratio BY HVI
5. Measurement of crimp in manmade staple fibres.
6. Measurement of fineness by airflow instrument.
7. Determinations of fibre parameters by AFIS
8. Study of creep and stress relaxation of filament yarn.
9. Determination of density of fibre.
10. Evaluation of filament denier.
11. Study of frictional behavior of filament yarn.

Reference Books :-

1. Physical Properties of textile Fibres, Morton and Hearle.
2. Physical Testing of Textiles by J.E. Booth.
3. Textile Testing by Angappan and Gopalkrishnan.
4. Manufactured Fibre Technology, Edited by V. B. Gupta and V. K. Kothari (1997) Chapman and Hall, London.
5. A. A. Vaidya, Production of Synthetic Fibres, Prentice Hall of India Pvt. Ltd., New Delhi 1988.
6. V. B. Gupta and K. K. Kothari (Ed), Man-made Fibres Production, Processing Structure, Properties and Applications, Vol. I and II, Dept. of Textile Technology, IIT, New Delhi 1988.
7. Manuals of HVI, AFIS.
8. Manual of Spinning by P. Lord.
9. Textile Testing by Skinkle.
10. Handbook of Indian Standards.
11. Production of Synthetic Fibres by A.A. Vaidya.
12. Testing and quality management (Vol. I) by V.K. Kothari.
13. BISFA Series on Manmade Fibres / Filament Yarns Testing.
14. BS Handbook.
15. ASTM Handbook.

THIRD YEAR B. TEXT - SEMESTER-I

5.2 YARN MANUFACTURING MACHINERY- IV (TPE)

Lectures	:	4 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1. Ring Spinning:-

a. Objects and principle of operation. Study of passage of material through the machine – structural configuration of the machine. Driving arrangement and calculation regarding production and twist.

b. Creel : Function, importance, study of conventional and modern creels.

c. Drafting System : Function, importance, arrangement of drafting assembly (evolution of the design of drafting systems on the ring frames), conceptual structure of the drafting system – The top rollers and bottom rollers – construction, types function and maintenance.

d. Top arm roller weighting system – study of weighting options – spring pneumatic, magnetic – Fibre guiding devices – long and short aprons, cradles, concept of e-drafting.

e. Spindle : Function, Importance, general construction of a spindle, design developments in spindles used on ring frames, spindle bearings, influence of spindle on the spinning process.

f. Drives – (A) Spindle drive – Types of drives used to drive spindles – (i) tape drive, (ii) tangential belt drive, (iii) direct drive, concept, design in working merits and demerits of each type.

g. (B) Drive to machine – single motor, dryal motor, variable speed (mechanical, electronically controlled and inverter) drive – design features, operating principle and merits and demerits of each.

h. The thread guide devices : Function, importance, types (fixed, rising and falling) settings.

i. The balloon control ring and the separator function, importance design features and settings.

j. Ring and Traveller : The function and importance of ring and travelers.

A. Ring :
   a) Ring shape – Standard, T flanged single and double sided, anti-wedge, SV ring, Indined flanged, enlarged and reduced etc.
   b) Ring material, brief note on ring manufacture.
   c) Methods of mounting ring on ring frame.
   d) Flange width and number, ring diameter – importance and specifications.
   e) Fibre lubrication on the ring
   f) Running in of new rings

B. Traveller:

C. Task and Function

D. Traveler shape and its applications

E. Traveller mass and its importance

F. Materials used per Travellers

G. Traveller wire profile

H. The traveler clearer

I. Cop Building : Cop shape the winding process. The building mechanism, forming the base, motor powered cop formation.

J. Automation in Ring Frame : Need, the potential for automation, concept and principle of operation of auto doffing, merits and demerits inter connected transportation.

K. Monitoring of Ring frame Operation : The objective ring data, individual spindle monitoring (ISM), mill information systems.

L. Ancillary Equipment :

M. Fibre extraction system (pneumafil) concept, importance, principle of operation.

N. Travelling Cleaners – The problem of dust and fly, types of travelling cleaners, construction and working.

O. Compact Spinning : Basic problem of hairiness of yarns on conventional, Ring frame – Solution to the problem, implementation of the basic solution, Advantages of condensing.

P. Types of compact spinning systems used, their merits and demerits. Comparison of compact yarns and conventional ring spun yarns.

Q. The spinning Geometry – Terms used (a) The spinning triangle, formation, dimensions and its influence on end breakage and yarn structure (b) The spinning length (c) Spinning angle (d) Roller over han (e) Other dimensions in spinning geometry.

R. Yarn Tension in Spinning : Concept and importance, tension variations during spinning – factors affecting tension in yarn, balloon theory. End breaks in ring spinning – importance and mechanism of end breaks, factors affecting end breaks.

S. Selection of ring frame specifications depending on count and material being processed. Defective production of ring frame and remedies. Routine maintenance schedule of ring frames Relative Humidification requirement and its importance.

2. Yarn Doubling and Folding:-

a) Objects of yarn doubling and folding, Basic concepts in twisting. Study of ring doubler and limitations of ring doubler.

b) Study of Constructional details, study of two for one twister, construction, working of different devices.

c) New developments in TFO twisting, Power consumption and noise level of TFO.

d) Twist setting of yarns.

3. Blend Spinning:-

Spinning of man-made fibres and blends with cotton on cotton system. Fibre characteristics and spinnability. Fibre properties and end uses, objectives of blending.

Measures of blending, blend migration, Tinting, Selection of blend constituents, Mechanics of blending. Blending techniques. Modifications of cotton spinning machinery for processing man-made fibres. Spinning of dyed fibres. Common faults in blended and 100% man-made staple yarns. Twist setting, winding and doubling. Properties of blended yarns. Blending of man-made fibre with wool and natural fibres.

Future machinery options for blend spinning. Processing of blends on Rotor and other spinning systems. Maintenances Hints while processing blends.

List of Experiments:-

1) Study of conventional ring frame, passage gearing calculations.
2) Study of modern ring frame, passage gearing calculations.
3) Measurement of various parameters related to spinning geometry.
4) Study of ring doubler passage, gearing and calculations.
5) Study of rotor spinning machine, constructional details and passage.
6) Study of building mechanism on ring frame.
7) Ring frame settings, spindle gauging, lappet guide settings, spindle trueing
8) Study of TFO, passage gearing, calculations.
9) Study of suction systems working on ring spinning and rotor spinning.
10) Study of data and interfaced systems on ring and rotor spinning.
11) Industrial visit to study modern ring spinning, doubling and rotor spinning.

Reference Books:-

1) Fundamentals of Spinning – P. Lord / C. A. Lawarance
2) Technology of Cotton Spinning – J. Janakiram
3) Trade Literature and Bulletins of Rieter LMW, Marzoli
4) NCUTE Pilot programmers in spinning.
5) SITRA Focus series.
6) Elements of ring frame and doublings by A. R. Kahre.
7) Manual of Textile Technology – Short Staple Series.
8) Vol IV A Practical Guide to Ring Spinning – W. Klein
9) Blend Spinning – K.R. Salhotra.
10) Two for one Twister technology and Technique for spun yarns by H. S. Kulkarni and HVS Murty.
11) Advances in Spinning – S. M. Ishtiaque

THIRD YEAR B. TEXT. - SEMESTER-I

5.3 FABRIC MANUFACTURING MACHINERY- IV (TPE)

Lectures	:	4 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1. **High Speed shedding mechanism :-**

a. Limitations of Tappet shedding motion, positive cam shedding concept and need, Positive cam shedding motions, details of construction and working (Ruti-C, Projectile, Rapier and Airjet), Adjustments essential during weave change and timing. Mounting possibilities, pitch of heald frames

b. Limitation of lever and cam negative dobby, positive lever dobby, positive rotary cam concept, Rotary mechanical and electronically controlled dobby, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.

c. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, adjustment for various weaves, Jacquard capacity, mounting, suitability for various end uses, data transfer and management, Networking with looms.

2. **Air Jet weft Insertion: -** Machines for air jet weaving, Introduction, overview of weft insertion elements, main nozzle designs, relay nozzle designs, stretch nozzle design. Configurations, loom timing of picking elements and settings, constructional details of profile reed. Air supply and energy consumption, Air flow in nozzles and guide channel, performance of yarns in air jet insertion, Optimization of settings, Weft stops and breaks, application of air jet weaving. Drive, Pneumatic circuit for air supply. Technical features of modern air jet weaving machines, (Dornier, Smit, Picanol, Sulzer) Quality of Air, Maintenance of machines. Quick Style Change.

3. **Water Jet Weft Insertion: -** Introduction, Design requirements, Picking mechanism, weft insertion elements, loom timing and settings, features of water jet looms, applications of water jet weft insertion system. Comparison with air jet, maintenance. Technical features of modern water jet weaving machines, (Nissan, Tsudokoma, Inventor) Comparison of various shuttle less weaving technologies with respect to reed width, loom speed, WIR and capital cost.
4. **Multiphase Weaving:**- Introduction, Classification, Methods to form warp wise and weft wise sheds, methods of picking, methods of beat up, limitations of multiphase weaving, applications, features of modern multiphase weaving machines e.g. M 8300, maintenance.
5. **Circular Weaving:**- Introduction, Classification as per number of shuttles, shedding, picking, beating, cloth collection, supply of warp yarn, stop motions for warp and weft, productivity, Maintenance. Technical features of Circular weaving machines, (Sterlings, Lohiya)
6. **Other Unconventional Weaving Methods :**

Triaxial Weaving: - Structure and Properties of triaxial woven fabrics, applications, weaving equipment for triaxial weaving.

Narrow Fabric Weaving:-

a. Introduction, Scope of narrow fabric weaving, applications
b. Preparation – Machines and processes for assembling warps, various warping processes used, weft preparation.
c. Technology of narrow fabric weaving – Machine construction, Shuttle looms, needle looms, warp feed systems from beams, creel, for elastomeric yarns, shedding by cam and links, pattern chain preparation for different weaves, weft insertion systems(needle loom) , various selvedge forming systems on needle loom, drives to different elements, take up.
d. Application of weaves in narrow fabric weaving.

Manufacture of Labels: - Applications, labels with woven selvedge and cut selvedge. Printed labels, fabric specifications, specifications of jacquard used, feed material specifications.

Braiding: - Introduction, classification (rounds and flat braids), applications, raw material used for braids, machines used for braiding (drive, yarn supply, Braiding technology, take up.)

7. **Non-wovens :-**
   Definition, classification according to raw material and method of production. Comparision of productivity with other technologies. Raw material used, process flow for manufacturing various non-woven techniques, introduction to web forming and bonding methods.
8. **Geo Textiles:-** Definition, classification, Raw materials, functions and area of application.

List of Experiments:-

1. Overhauling of Sulzer picking motion.
2. Study of style change process on projectile (Sulzer) Machine.
3. Study of let-off motions of all shuttle less weaving machines and operations of looms.
4. Study of control panel of Dornier weaving machine and fabric production with changed parameters.
5. Study of style change, control panel of SMIT Air Jet weaving machine and fabric production with changed parameters.
6. Study of Dobby CAD software
7. CAD software application – Creation of weaves
8. CAD software application – Creation of weaves.
9. Study of style change on Dornier
10. Study of sample weaving equipment
11. Visit to rapier weaving unit.
12. Study of needle loom technology, Braiding machine Technology and production of fabric on them
13. Visit to circular loom unit.

Reference Books

1. Handbook of weaving – Sabit Adanur.
2. Modern preparation and weaving machinery – A Ormerod
3. Shuttleless weaving machine – Svaty.
4. Shuttleless Looms – J. J. Vincent
5. Shuttless weaving machine – O. Talavasele, V. Svaty
6. Narrow Fabric Weaving - Sauer Lander Verlag
7. Narrow Fabric Group Conference – Textile Institute
8. Braiding and Braiding Machinery – W. A. Douglass
9. Manual of Nonwoven by Dr. Radko Krima.
10. Geo-textiles by N.W.M. John.

THIRD YEAR B. TEXT. -SEMESTER-I

5.4 AMBIENT CONDITIONS IN TEXTILES MILLS (TPE)

Lectures	:	3 Hrs / Week
Tutorial	:	1 Hr / Week
Theory Paper	:	100 Marks
Term work	:	25 Marks
Subject Total	:	125 Marks

1) Thermodynamics -

Laws of thermodynamics applied to refrigeration. Introduction of basic terms – specific volume, density, specific weight, energy, internal energy, flow energy work, specific heat, sensible heat, latent heat, entropy, enthalpy, difference between gas and vapour, COP, ton of refrigeration.

2) Refrigeration -

Air refrigeration system – reversed carnot cycle as most efficient refrigerators. Bell column cycle, advantages, disadvantages of air refrigeration.

Simple Vapour compression refrigeration system – T.S., H.S. P-H diagrams comparison with air compression system, Coefficient of performance.

3) Refrigerants -

Properties of ideal refrigerants, classification of refrigerants, difference between primary and secondary refrigerant, comparison of refrigerants – Air, NH_3, R-11, R-12, selection of refrigerants.

4) Equipments: used in refrigeration and air conditioning working principle and applications of hermatically sealed compressor, condenser, evaporator, fans, blowers, air washers, filters, heaters, heat pumps, grills, registers, humidifiers and dehumidifiers used in textile A/C plant.

5) Comfort -

Factors affecting comfort, thermal exchange of human body with environment, heat disorders, comfort chart.

6) Psychrometry -

Psychrometric terms, Dalton's law of partial pressure, psychrometric relations, psychrometric chart, psychrometric processes – sensible heating and cooling, cooling with dehumidification, heating with humidification, humidification by steam injection, adiabatic chemical dehumidification, adiabatic mixing of air streams, bypass factor of heating and cooling coil, efficiency of heating and cooling coil, efficiency of humidifier, sensible heat factor. Numericals based on above topics.

7) Air conditioning systems -

Summer air conditioning, winter air conditioning, modern year round air conditioning, ambient conditions required in various departments of textile mill and controlling ambient conditions.

8) Air distribution systems -

Re-circulated air, conditioned air, duct work, use of friction loss chart, rectangular equivalent of round duct, Duct systems, principle of duct sizing, different air distribution systems.

9) Design of Air conditioning system – Design hints for practical design of air conditioning and humidification plant.

Ventilation and air changes required for various departments of textile mill. Calculations of heat load, cooling coil capacity, humidifier capacity, heating coil capacity.

TERM WORK :-

Term work based on above syllabus

Reference Books:-

1) Refrigeration and Air conditioning – C.P. Arora
2) Refrigeration and Air conditioning – R.S. Khurmi
3) Refrigeration and Air conditioning – Arora, Domkundwar
4) Air conditioning in Textile mills - S.P. Patel (ATIRA)

THIRD YEAR B.TEXT. - SEMESTER – I

5.5 ANALYSIS OF MECHANICAL ELEMENTS (TPE)

Lectures	:	4 hrs/week.
Practicals	:	2 hrs/week.
Theory Paper	:	100 marks.
Term Work	:	50 marks
Subject Total	:	150 marks.

1. Strength and elasticity of material, simple stresses, strains, behaviour of brittle and ductile material under tension. Relation between elastic constant, Poisson's ratio, volumetric strain, principle of complementary shear stress.

2. Bending stress – Symmetric bending of beams, standard beam sections, built up sections, design problems. Study of bending in drafting roller.

3. Direct and bending stresses – Uniaxial bending, concept of biaxial bending, kern of section, chimneys subjected to wind pressure.

4. Distribution of shears stresses in beams of standard sections.

5. Strain energy and impact loading, concept of strain energy, strain energy in bending, stresses due to impact.

6. Torsion – Torsion of circular shafts, transmission of power through shafts. Power transmitted by shaft. Study of torsion in Textile m/c. shaft.

7. Riveted and welded connections : Analysis and design for direct loads.

8. Shear force and bending moment : Shear force and bending moment for simply supported beams, overhanging beams, cantilevers with point loads and uniformly distributed loads. SFD and BMD.

9. Slope and deflection of beams : Calculation of slope and deflection for simple beams with point loads and udl, Macaulay's method.

10. Testings of materials : Material properties, tension, compression, shear, hardness, fatigue, endurance limit, Testing procedure.

Term Work:

Term work shall consist of experiments based on following tests:-

1. Tensile test on ductile material
2. Compression test on ductile material
3. Shear test
4. Izod impact test
5. Charpy impact test
6. Rockwell hardness test
7. Brinell hardness test.
8. Testing of Composite materials – hardness.

Reference Books :-

1. Strength of Materials : Ramamrutham.
2. Elements of Strength of Materials : S.P.Timoshenko and D.H. Young
3. Mechanics of Structures : S.B. Junnarkar
4. Strength of Materials : Vazirani and Ratwani

THIRD YEAR B.TEXT. - SEMESTER – I

5.6 METALLURGY (TPE)

Lectures	:	3 Hrs / Week
Theory Paper	:	100 Marks
Term work	:	25 marks
Subject Total	:	125 Marks

1) **Metal and Alloy System:**

   a) Metals, metallic bonds, Crystal structures (BCC,FCC, HCP),
   b) Imperfections in crystals.Alloy formation by crystallization,
   c) solidification, cooling curves,Allotropy, solid solution systems,
   d) phase and phase rules, Structural constituents, lever arm principle.

2) **Equilibrium Diagram**:

   a) construction of equilibrium diagrams from cooling curves,
   b) Solid solution type and eutectic, Off eutectic type diagrams,
   c) Introductory information with diagrams and common alloys on it.
   d) Eutectoid, Peritectic Diagram and common alloys.

3) **Metallographic testing** :

   a) Sampling, mounting, polishing, etching, microscopic examination.
   b) Macro examination of Metals, sulphar printing

4) **Study of phase Diagrams:-**

   a) Iron –carbon equilibrium diagram phases and reactions
   b) Details of Iron –carbon equilibrium diagram
   c) Equilibrium diagrams of Cu-Zn, Cu-Sn, Al-Cu (Only Al rich portion)
   d) Equilibrium diagrams of Cu-Be, Al-Si and its modification, applications.

5) **Compositions :**

   a) Properties and Applications of ferrous and non ferrous metals and alloys,
   b) selection of metals for common Application, Plain carbon steel, Alloy steels Stainless steels, tool steel, Heat resistant steels. structural steels,

c) Cast Irons- Grey, white, Malleable, SG iron, wrought Iron.
d) Brasses, Bronzes , Bearing metals , Aluminium and Nickel alloys.

6) Material selection :

a) Specifications -IS, BS, ASTM, SAE, DIN, ISO, Selection of Materials based on applications in Textiles like Torsion bar, Seizer blade,
b) Material selection for knitting needles, spinning rings, Gears, machine frames, yarn guides, tools ,magnets, bearings, cams etc.

7) Powder Metallurgy :-

a) Powder metallurgy applications, advantages and limitations,
b) Powder preparation methods-mechanical, physical and chemical methods
c) Powder metallurgy stages-mixing/blending, compacting ,sintering
d) Manufacturing techniques with flowcharts for electric contacts, oil impregnated Bearings, cemented carbide cutting tools, Friction materials, Sintered bushes.

8) Principles of Heat Treatment :

a) Introduction to phase transformation- pearlite to austenite,
b) phase transformation –Austenite to Pearlite, bainite, martensite
c) TTT Diagrams- significance, effect of alloying elements on TTT diagrams CCT diagrams- critical cooling rate.

9) Heat treatments processes:

a) Annealing –Full, sub critical, spheroidizing, stress relieving
b) Normalizing, Hardening,
c) Tampering-types, structural transformations, Sub zero treatment,
d) Surface hardening-flame, induction, Case hardening –carburizing, Nitriding, cyaniding
e) Heat treatment defects and remedies, furnaces used, atmospheric conditions
f) Precipitation hardening Requirements, Principle of age hardening-solutionzing, Aging, overaging
g) G. P. Zone theory, dispersion hardening, Effect of variables-Composition, , Aging Time and Temperature, Important applications: Al+4%Cu, Cu + 2%Be, 17 – 7pH Alloy.

10) Metallurgy of Joining :

a) Soldering: Temperature range and fluxes, Brazing alloys, Welding: Types, Gas welding, Arc welding, Resistance Welding,

b) TIG and MIG Welding, Electron Beam Welding and Laser Beam Welding.

11) Surface treatments:

a) Pickling, Hard chrome plating, Phosphate coating, Calorizing, zinc coating and galvanizing,

b) Aluminizing and related modern surface improvement techniques.

12) Introduction to Composites:

a) Metal Matrix composites, Polymer Matrix Composites,

b) Fiber Reinforced Composites and new developed composites in textile industries.

Termwork :-

Minimum five assignments on the above topics are to be submitted in the journal as assignment

Reference Books:-

1) Physical Metallurgy- Vijendra Singh, Standard publishers, Delhi.
2) Material Science and Metallurgy - Dr.V.D. Kodgire.
3) Introduction to Physical Metallurgy - Avner
4) Physical Metallurgy – Vijendra Singh
5) Metallurgy for Engineers - Clerk and Varney
6) Engineering Metallurgy Vol.1 and 2 - Higgins
7) Powder metallurgy-Dr A.K.sinha.
8) Metallurgy for Engineering technicians - Rollson
9) Heat treatment principles and practices-T.V.Rajan and C.P.Sharma.
10) Mechanical metallurgy G.E.Diater, Tata McGraw-hill, New Delhi.
11) Material science and Metallurgy, C. Daniel Yesudin7others, Scitech Publication
12) Material Science And Engineering by W.D.Callister ,Wiley (India) Edition

THIRD YEAR B. TEXT - SEMESTER-I

5.2 TECHNOLOGY OF DYEING - I (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam.	:	50 Marks
Subject Total	:	175 Marks

1) **Preparation of natural fibres for dyeing: -** General theory of cellulosic and protein fibres structures. Effect of different pretreatments like Scouring, Mercerization, Bleaching, Degumming etc. on dyeing. Quality parameters required for fabric to be dyed, study of dyeing machinery such as Jiggers, Winches, Package dyeing machine, Continuous dyeing machine. Recent developments in dyeing machines.
2) **Dyeing with Direct Dyes: -** General principles of application of Direct Dyes. Parameter affecting dye absorption and levelling. Application properties of direct dyes. Batch wise application of direct dyes. Semi and fully continuous dyeing process for direct dyes. After treatments, effect of finishing treatments on hue and fastness. Problems and remedies in dyeing cotton, viscose, and their blends with direct dyes.
3) **Dyeing with Reactive Dyes: -** Reactive Systems, Batch wise dyeing methods, Semi and fully continuous dyeing methods, washing off and after treatments. Stripping of goods dyed with reactive dyes, fastness problems.
4) **Dyeing with Vat Dyes:-** Fundamental Principles of Dyes and their classification Auxiliaries, Vatting, properties of Leuco vat dyes, Dyeing, Fundamental processes, Batch wise, semi continuous and continuous dyeing process. Dyeing of Loose stock, Yarn packages, Hank, Woven Fabric, Knit goods, Dyeing with Indigo, Correction of faulty dyeings.
5) **Dyeing with Sulphur Dyes: -** Classification and different commercial forms of sulphur dyes. Different Auxiliaries like reducing agents, anti oxidants, Sequestering agent, wetting agents and oxidizing agents. Different application methods for yarn and fabrics. Batch wise and

continuous dyeing methods, problems and remedies in dyeing of cotton with sulphur dyes.

6) **Dyeing with Azoic Colours:-** Chemical constitution, Treatment with napthols, Intermediate treatments, Development, After treatments, Dyeing of yarn and fabric with batch, semi continuous and continuous processes, stripping of azoic dyeings.
7) **Dyeing with Acid Dyes: -** Classification of acid dyes with mechanism. Factors affecting the acid dyeing of protein fibres. Principles of application of acid dyes to protein fibres. Dyeing of wool and silk.
8) **Dyeing with Basic Dyes:-** Mechanism of dyeing. Dyeing assistants. Application of Basic dyes to silk in different characterized bath. Dyeing of wool with basic dyes. Application of Basic dyes to cellulose materials. Stripping of basic dyes. Problems and remedies in dyeing.
9) **Dyeing with Ingrain Dyes:**- Application of mineral Khaki and phthalogen blue on cellulose. Dyeing with pigment colours with batch and continuous methods,
10) **Dyeing with Natural Dyes:-** Classification of natural dyes, sources, and different methods of application of natural dyes.

List of Experiments:-

1) Dyeing of the cotton fabric with direct dyes in OBBD machine.
2) Different after treatments on direct dyed fabric.
3) Dyeing of cotton yarn with HE brand reactive dyes in package dyeing machine.
4) Dyeing of the cotton fabric with cold brand reactive dyes in jigger dyeing machine.
5) Dyeing cotton knit goods with reactive dyes on a soft flow dyeing machine.
6) Dyeing of cotton yarn with vat dyes in package dyeing machine.
7) Dyeing of cotton fabric with different padding methods like cold pad batch, pad bake and pad steam.
8) Dyeing of cotton with azoic colours
9) Dyeing of cotton knits in winch with sulphur dye.
10) Dyeing of wool and silk with Basic Dye.

11) Dyeing of wool and silk with Acid Dye.
12) Dyeing of cotton with Mineral Khaki.
13) Dyeing with natural dyes.
14) Preparation of compound shades of reactive dyes.

Reference Books

1) Dyeing and chemical Technology of Textile Fibres by E. R. T. Trotman
2) The dyeing of cellulose fibres by Clifford Pireston
3) Textile processing and properties by T. L. Vigo
4) Chemical technology of fibres materials by F. Sadav
5) Silk Dyeing printing and finishing by Prof. M. L. Gulrajani
6) Technology of Dyeing by Dr. V. A. Shenai.

THIRD YEAR B. TEXT - SEMESTER-I

5.3 TECHNOLOGY OF PRINTING-I (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam.	:	50 Marks
Subject Total	:	175 Marks

1) Introduction :-

- Historical background of printing of textiles.
- Preparation of cotton fabric for printing.

2) General:-

- Styles of Printing
- Fixation of printed textiles
- Methods of Printing

3) Table screen printing

- Technical features of table.
- Technical features of printing on table.
- Faults of table screen printing, their causes and remedies.

4) Flat bed screen printing

- Features of flat bed screen printing m/c. and its various parts.
- Technical features of printing with flat bed printing m/c.
- Flat bed screen printing m/c. for garments.
- Faults of flat bed screen printing m/c., their causes and remedies.

5) Rotary screen printing m/c. -

- Features of rotary screen printing m/c. and its various parts.
- Squeezee system.
- Technical features of rotary printing m/c.
- Faults of rotary screen printing m/c. causes and remedies.

6) Inkjet / Digital printing.

- Basic principles.
- Mechanism of printing.
- Requirement of ink

7) Recent developments in flat bed screen printing m/cs.

8) Recent developments in rotary screen printing m/cs.

9) Printing paste

- Printing paste ingredients and their functions.
- Different types of thickeners and their chemistry.

10) Printing with direct dye

- Print paste ingredients for direct and discharge style of printing.

11) Printing with reactive dyes

- Print paste ingredients for direct, discharge and resist style of printing.

12) Printing with Pigments

- Pigments and their classification
- Print paste ingredients

List of Experiments:-

1) Tie and dye style of printing.
2) Batik Style of printing.
3) Direct style of printing with direct dye.
4) Discharge style of printing on direct dyed ground.
5) Direct style of printing with reactive dyes by using various fixation methods.
6) Direct style of printing with reactive dyes by using various thickeners.
7) Discharge and resist style of printing on reactive dyed ground.
8) Direct style of printing with pigments.
9) Direct style of printing with pigments by using various thickeners.
10) Direct style of printing with azoics.
11) Visit to printing units.

Reference Books:-

1) Textile Printing by L.W.C. Miles.
2) An Introduction to Textile Printing by W. Clarke.
3) Technology of Printing by Dr.V.A. Shenai
4) Book of Papers, QIP Summer School on “Advances in Textile Chemical Processing: Edited by Dr. R.B. Chavan.
5) Textile Printing Book of papers by Prof. R.B. Chavan.
6) Processing of silk by Prof. M.L. Gulrajani.
7) Proceedings: Recent advances in Textile Processing lectures/seminer, Dec.1982, I.I.T., Delhi.
8) Colourage, ITB International bulletin on dyeing printing and finishing.

THIRD YEAR B.TEXT. – SEMESTER-I

5.4 TECHNOLOGY OF FINISHING-I (TC)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter – I Introduction to Finishing and Finishing Machinery

Object of finishing, Importance of textile finishing, classification of finishing, process sequence of finishing of 100% cotton, 100% Wool and 100% silk fabrics, concept and working of machinery like Calendering, Decatising, Raising, Sueding, felting, Sanforising, Stenter, Aero finishing.

Chapter – II Resin Finishing

Mechanism of creasing and resin finishing, Types of resin finishing, concept of Anticrease, wash-n-wear and Durable Press, Role of catalysts in resin finishing, Classification of resins and catalysts, Concept of deferred cure and post cure. Limitations of resin finishing, Causes of strength loss of resin finished fabric. Various approaches towards reducing the strength loss of resin finished goods. Mechanism of chlorine retention, Mechanism of formaldehyde release, various methods to reduce formaldehyde release. Eco-friendly cross linking agents, Low and ultra low formaldehyde resins. Resin finishing formulations for 100% Cotton garments, 100% cotton shirting, 100% cotton suiting, Evaluation of Resin Finishing.

CHAPTER – III Flame Retardant Finishes

Concept of flame proof and flame retardancy. Limiting oxygen Index and its importance, Thermal behaviour of textile fibres. Concept of solid phase and Gas phase flame retardant. Classification of flame retardants. Mechanism of the mode of action of flame retardant. Factors affecting flame retardancy. Essential requirements of a good flame retardant. Various flame retardant finishes for cotton, wool, silk, polyester and nylon, Evaluation of flame retardant finish.

Chapter – IV Antimicrobial Finishes

Object, requirements, types of anti microbial finishing. Mechanism of antimicrobial finishing. Desirable properties of a good anti microbial finishes, various antimicrobial finishes for cotton, wool, silk, PET, Nylon and Acrylic, Mildew-proof and rotproof finishing, Evaluation of antimicrobial finishes.

Chapter – V Softeners and Hand Builders

Desirable properties and various classes of softeners, Properties, mode of action and application of cationic, anionic, Non-ionic, reactive and emulsion type softeners. Softeners for cotton, wool, silk, jute, polyester and acrylic. Comparison of various softeners, Classification of stiffeners, examples and their application.

Chapter – VI Finishing of Animal Fibre and Bast Fibres

Weighting of silk, various mechanical and chemical finishes for silk and wool, Mechanism of setting of wool, concept of wet setting of wool, woollenisation of Jute, Various finishes for Jute and Linen.

Chapter – VII Finishing Formulations

Waterproof and water repellent finishing, Organdie finishing, Biopolishing. Finishing recipes for 100% cotton, wool, silk, jute. Problems and remedies in finishing

List of Experiments:-

1. Preparation and application of Blue Tone and Red Tone on cellulosic.
2. Preparation and application of Blue Tone and Red Tone on synthetic and its blends.
3. Finishing of cotton for imparting soft, medium and stiff handle.
4. Application of OBA on cellulosic by continuous and exhaust method.
5. Resin finishing of cotton.
6. Application and evaluation of flame retardant finishing on cotton
7. Application and evaluation of antimicrobial finish on cotton.
8. Application and evaluation of various types of softeners on cotton.
9. Finishing of wool to impart moth proofing.
10. Finishing of Silk to impart crease recovery property, soil release and softness.

11. Finishing of Jute.
12. Application and evaluation of waterproof / Water repellent Finishing on cotton
13. Biopolishing of cotton.

Reference Books:-

1) Chemical after treatments of textile by Marks, Atlas and Wooding.
2) Textile finishing by A.J. Hall.
3) Introduction to textile finishing by J.T. Marsh.
4) Technology of finishing – Vol. X by Dr. V.A. Shenai.
5) Chemical processing of polyester/cellulosic blends by R.M. Mittal and S.S. Trivedi.
6) Silk dyeing, printing and finishing by Prof. M.L. Gulrajani.
7) Handbook of textile finishing machinery by R. S. Bhagwat.
8) Finishing, reference book of textile technologies by ACIMIT
9) Textile finishing by Heywood , SDC Publications
10) Chemical processing of polyester/cellulosic blends by R.M. Mittal

THIRD YEAR B.TEXT. – SEMESTER-I

5.5 CHEMICAL ENGINEERING OPERATIONS (TC)

Lectures : 3 Hrs / Week
Theory Paper : 100 Marks
Subject Total : 100 Marks

1. Introduction

Introduction to the chemical engineering. Definition and classification of mass transfer operations. Definition and classification of diffusion . Fick's law of diffusion. The concepts of diffusion rate, diffusion co-efficient and diffusivities. Relevance of mass transfer studies to textiles .

2. **Unit operations**

Introduction. Difference between unit operations and unit processes. Study of different unit operations of chemical engineering like distillation, extraction, absorption, adsorption, evaporation, crystallization with respect to their concept, principle of separation, types, performance analysis and applications from textile industry view point.

3. Drying

Introduction, concept of drying. Definition, principle and purposes of drying. Concept of simultaneous heat and mass transfer operations. Equilibrium relationship, rate of drying. Heat and mass balance of drying operation. Heat capacities of textile materials. Theory of drying. Relevance of drying to textile industry. Principle and operation of various textile dryers like drum dryer, tumble dryer, stenters, study of new drying techniques like IR, RF drying. Numericals based on above

4. **Size Reduction**

Brief introduction to mechanical operations. Definition of size reduction operations, classification of size reduction equipments. Concept of crushing efficiency and work index. Laws of crushing and grinding. Applications of the size reduction operations .Principle and operation of a ball mill.

5. **Mechanical separation and mixing**

Importance of the screening of size reduced materials. Concept of particle size, particulate matter.Introduction to sieve analysis. Screen efficiency, screen effectiveness. Simple numericals based on above.

Brief study of mixing operation. Need of liquid mixing in textiles. Brief study of mixing performance analysis. Classification of mixing equipments.

6. **Filtration**

Introduction to filtration operation. Concept of filter media, filter aids, various types of filters used in textiles, advantages and uses of filtration operation. Applications of filtration operation to textiles. Working principle of filtration equipments. Simple numericals based on rate of filtration.

Definition and need of settling processes. Types and applications of settling process in reference to textile processing industry.

7. Membrane separation techniques

Introduction, types of membranes, Merits and demerits of these operations over the conventional mass-transfer operations. Principle of operation, separation size range, rate expressions and applications of the membrane technologies like reverse osmosis, dialysis, electro-dialysis, ultra-filtration, micro filtration.

Reference Books:-

1. 'Mass Transfer Operations' by Treybal, McGrawHill publication. (1955)
2. 'Introduction to Chemical Engineering', by Badger and Banchero, McGraw Hill publication (1955)
3. Transport Phenomena by Beek and Muttzall, Byron Bird R., Wiley publication. (1975).
4. 'Theory of Coloration of Textiles' by Bird and Boston, Dyers Company Publications Trust, (1975).
5. The Physical Chemistry of Dyeing, Volume-III, by R.H. Peters, Elsevier publication (1975).
1. 'Chemical Engineers' Handbook, by Perry, McGraw-Hill publication.
2. 'Unit Operations in Environmental Engineering' by R. Elangovan, M. K. Saseetharan, New Age International (P) Ltd., Publishers.
3. 'Coulson and Richardson's Chemical Engineering' Volumes 1-6, Asian Books Pvt. Ltd.,

THIRD YEAR B. TEXT - SEMESTER-I

5.6 PHYSICAL CHARACTERISTICS OF TEXTILE FIBRES (TC)

Lectures	:	3 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

1. Fibre structure - Requirements of fibre formation- molecular weight and degree of polymerization - useful limits of polymerization- crystalline and amorphous regions-molecular structure of fibres - morphological models - one phase, two phase, three phase models, morphology of various fibres.
2. Techniques for investigation of fiber structure
   a. Optical properties of textile fibres - Refractive Index- Double refraction, Birefringence. Optical heterogeneity in fibres - Factors influencing the birefringence of a fibre, Measurement of birefringence - Beckeline method-Compensator method - Interference microscopy-Refractometer method-Significance of birefringence, Optical dichroism and its importance.
   b. X-ray Diffraction Investigations- Introduction, Production and origin of X-rays-Bragg's law of x-ray diffraction - crystal structure- miller indices-Determination of fibre structural parameters by x-ray diffractometer and fibre diagram techniques, small angle scattering.
   c. Electron Microscopy –Principle of electron microscope- Transmission and scanning electron microscope - Principle, Working and Applications.
   d. Infrared Spectroscopy –Spectroscopy, Beer-Lambert law, Principles of IR-Spectroscopy, Principle and working of IR spectrophotometer, Applications, IR-Dichroism and its importance.
3. Mechanical Properties of Textile fibres
   a. Tensile properties- Terminology, Factors influencing the tensile properties of fibres
   b. Elastic recovery- Definitions,Effects of test conditions on elastic recovery of fibres- Mechanical conditioning of fibres-swelling recovery

c. Forces in various directions-bending and twisting of fibres, derivation of flexural and torsional rigidity, shear modulus-shear strength-general elastic deformation-compression.

d. Theories of Mechanical Properties-approaches-structural effects in fibres-theories of time dependence-thermodynamic effects, Boltzmann super position principle, WLF equation, creep stress relaxation, stress-strain curve, dynamic mechanical properties, their measurement and importance.

4. Model theory of viscoelasticity - Linear viscoelasticity, viscoelastic models - Features of Eyring model.

5. Moisture relations and testing –

   Regain and moisture content – Measurement of atmospheric conditions – Control of testing room atmosphere, Regain – humidity relationships, Effects of regain on fibre properties.

   The measurement of regain – correct invoice weight – moisture testing ovens – rapid drying oven – Drying by means of chemical ovens – Drying by hot air-currents – Drying by radio frequency wave – Regain measurement by methods based on resistance and capacitance principles.

6. Thermal properties-Introduction-Specific heat capacity, thermal conductivity, structural changes in fibres on heating and setting, Transition in fibres-primary and secondary transitions and their significance, factors influencing them, degradation and decomposition, Thermal expansion of fibres. Principle, working and applications of DSC, DTA, DMA.

7. Electrical properties: Static electricity-its generation and consequences measurement of static electricity, Dielectric properties-permittivity, dielectric constant, dissipation factor, power factor, factors influencing the dielectric properties, measurement of dielectric behavior of fibres, Electric resistance-Specific resistance- Measurement of resistance-Factors influencing the electrical resistance of fibres.

List of Experiments:-

1) Study of convolutions in Cotton fibre.
2) Measurement of moisture regain by Shirley trash analyser.
3) Determination of torsional rigidity of fibre.
4) Measurement of tenacity of filaments by Instron tester.
5) Study of creep and stress relaxation by Instron tester.
6) Determination of thermal insulation value of given fabric.
7) Study of shrinkage behavior of filament yarn.
8) Determination of work of rupture of filament yarn.
9) Determination of elastic recovery of filaments.
10) Identification of textile fibres by microscope.

Reference Books:-

1. Fibre Science- Edited by J.M. Preston, Published by the textile institute, Manchester
2. Physical Methods of Investigation of Textiles, Edited by Meredith R. and Hearle J.W.S.-Published by Textile Book published Inc. New York
3. Physics of fibres- An Introductory Survey-Woods H. J. Published by the Institute of Physics-London, 1955
4. Applied Fibre Science- Vol I-Edited by F. Happey published by Academic Press, London
5. Physical Properties of Textile Fibres-Morton W. E. and Hearle J.W.S. published by the Textile Institute Manchester
6. Fibre Microscopy-Stores J. L. published by London National Trade Pr
7. Structure/Property relationship in Textile Fibres-Textile Progress Vol. 20 No. 4 The Textile Institute Manchester
8. Textile Fibres Yarns and Fabrics – Kaswell E. R. published by Reinhold Publishing Corporation- New York, 1954

THIRD YEAR B.TEXT. – SEMESTER - I

5.1 TEXTILE ELECTRONICS (FT)

Lecturers	:	3 hrs/week
Practical	:	2 hrs/week
Theory paper	:	100 marks
Practical Exam.	:	50 marks
Subject Total	:	150 marks

1) Electronics Components

Electronics components, passive components, resistors, color coding of resistors, variable resisters, capacitors, color code used for capacitors, variable capacitors, inductors.

2) Semiconductors

Semiconductor materials, metals, insulators semiconductors, intrinsic semiconductor, extrinsic semiconductors, p-n junction diode, junction theory, VI characteristics of p-n junction diode, use of diode in rectifiers, half wave rectifier, full wave rectifiers, performance of rectifiers, filters-shunt capacitor filter, series inductor filter, filter, LC filter, zener diode, zener regulator, diode specification.

3) **Transistor**

Junction transistor structure, working of transistor, relation between different currents in a transistor, transistor amplifying action transistor configurations, transistor characteristics (More emphasis CE configuration). Basic CE amplifier transistor data sheet, transistor testing.

4) **Op-Amp**

Introduction, block diagram, symbol, ideal op-amp, open loop
op-amp configuration, Concept of feedback in amplifier, op-amp with negative feedback, IC741-pinout and specifications, applications.

5) Power Semiconductor Devices and Applications

SCR construction Principle of operation, two transistor analogy, turning ON and OFF of SCR, SCR characteristics, Triac- Construction, working and characteristics, diac- construction, working and characteristics , UJT -

Construction, working and characteristics. UJT as Relaxation Oscillator, Application of SCR – Single Phase Half Wave Controlled Converter, SCR in DC Motor speed control. AC power control using triac.

6) Optoelectronic Devices

Classification of optoelectronic devices- emitters, sensors, optocouplers, LED, photodiode, phototransistor, LDR, photo voltaic cell, application of optoelectronic devices in textile.

8) Transducers

Transducer classification – Primary and secondary transducers, active and passive transducers, analog and digital transducers, advantages of electrical transducer, Basic Requirements of a transducer

Pressure measurement – Diaphragm bourdon tube Bellows.

Temperature Transducers – Resistance temperature Detector (RTD), Thermocouple, Thermisters

Strain Measurement – Introduction, factor affecting strain measurement, types of strain gauge, Theory of operation of resistance strain gauge, types of electrical strain gauge, properties of strain gauge, materials for strain gauges, electrical strain gauge, properties of strain gauge, materials for strain gauges,

Linear variable differential transformers (LVDT),

Capacitive transducers, Piezo electric transducers.

Note: Emphasis should be given on applications of above transducers in textile industry

8) Electromechanical Devices

Electromagnetic relay, Reed relay, Solenoid valve, Limit switches.

10) Introduction to Digital Electronics

Difference between digital and analog electronics, digital gates, Working, truth table and Boolean equation, with examples from TTL family.

List of Experiments:-

2) Forward and reverse bias characteristics of diode.
3) Half wave rectifier (with and without filter).
4) Full wave rectifier (with and without filter).
5) I/O characteristics of transistor in CE configuration
6) Op-amp inverting and non-inverting amplifier.
7) UJT characteristics
8) Study of AC power control using triac.
9) LDR characteristics.
10) Speed measurement using optical and magnetic pickups.
11) Study of RTD and thermister characteristics.
12) Study of strain gauge characteristics.
13) Study of LVDT characteristics.
14) Study of inductive and capacitive pickup.
15) Study of SCR characteristics
16) Study of basic gates.

Reference Books:-

1) 1. Basic Electronics and Linear Circuits by N.N. Bhargava, D.C. Kulshreshtha TMH Pub.
2. Electronic Devices and Circuits by Allen Mottershade, PHI Pub.
3. Modern Industrial Electronics by T.J. Maloney. Fourth Edition, Prentice Hall
2) Pub.
4. Electrical and Electronics Measurements and Instrumentation by A.K. Sawhey,
3) Dhanpat Ria and Sons Pub.
5. Instrumentation Devices and Systems by C.S. Rangan, G.R. Sharma, TMH Pub.
6. Electronics Components and Materials by Madhuri Joshi
7. Op-amp and Linear Integrated Circuits by Ramakant Gaykwad.
8. Thyristor and their Applications by Ramamurthi
9. Digital Principles and applications by Malvino and Leach.

THIRD YEAR B. TEXT. - SEMESTER-I

5.2 STRUCTURE & PRODUCTION OF KNITTED FABRIC (FT)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

I) **Introduction**:- Reasons for the growth of knitting, Comparison of knitted and woven fabric with respect to production and properties, Hand knitting. Knitting processes (weft and warp) and their structures. Basic terms and definitions used in knitting (wales, courses, stitch length, stitch density, face and back loops)

II) **Weft Knitting**:-

1. Machine: Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as : Creel, Yarn feeding – Need, types, stop motions, indicators, tensioners etc. , Loop forming mechanism – Knitting cycle, types of needles and their comparison, Study of essential elements of loop forming such as cylinder, sinker, cam, dial, yarn guide etc, Loop forming cycle for single jersey, rib and Interlock fabrics. Take down motion – Spreader, Nip roller, cloth roller
2. Fabric structures: - Principle stitches such as Knit, Tuck, Miss and their representation, their effects on fabric properties. Types and properties of knitted fabrics such as single jersey, double jersey and their derivatives like interlock, Rib and purl. Pattern analysis method, Design, Needle order and Cam order. Pattern structures with one, two, three and four needle types (1. Single Jersey: cross miss, Lapique, Longitudinal tuck stripes, Plain pique. 2. Rib : Milano, Half Milano, Cardigan, Half Cardigan, Double Cardigan, Swiss and French double pique. 3. Interlock: Pique, Texi Pique, Pin tuck, Interlock Super Roma, Bourrelet). Concept of colour and structure Jacquards. Fleecy fabrics, plush fabrics, stripers, Loop transfer.
3. Study of weft knitted fabric defects and their remedies, yarn quality requirements.

4. Circular weft knitting machine production calculations, fabric weight and Tightness factor. Knitted fabric relaxation concept.

III) **Flat Knitting :-**

1. Basic elements and their functions of flat knitting machine. Hand and machine operated flat knitting machines and their knitting actions.
2. Machine operation for various stitches such as Miss, Tuck, Transfer, drop stitch.
3. Design with and without needle selection, bed racking, new formed and transfer loop for hand and power operated machines.
4. Concept of seamless knitting.

IV) **Warp Knitting :-**

1. Passage of yarn through warp knitting machine. Essential elements of warp knitting machine. Knitting cycle of Tricot and Raschel warp knitting machine.
2. Study and representation of single and two guide bars structures like Piller stitch, Tricot, Blind lap, In lay, Atlas, Full Tricot, Locknit, Reverse Locknit, Satin, Loop raised, Shark Skin, nettings and Crochet
3. Methods for calculating runner ratios for each bar for different structures.
4. Fabric weight calculations, Production calculations

List of Experiments:-

1. Study of single jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
2. Study of double jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
3. Study of warp knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
4. Study of flat knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
5. Design setting on single jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.

6. Design setting on Double jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
7. Knitted fabric analysis Single jersey
8. Knitted fabric analysis Derivative of single jersey
9. Knitted fabric analysis. Derivative of single jersey
10. Knitted fabric analysis. Double Jersey
11. Knitted fabric analysis. Derivative of Double Jersey
12. Visit to knitting unit.

Reference Books:-

1. Knitting Technology by Prof.D.B. Ajgaonkar.
2. Circular Knitting by Dr. Chandrashekhar Iyer.
3. Knitting Technology by Mr. D. Spenser.
4. Warp Knitting by Dr. S. Raz.
5. Flat Knitting by Dr. S. Raz.

THIRD YEAR B. TEXT. - SEMESTER-I

5.3 GARMENT PROCESSING (FT)

Lectures	:	3 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Mark
Subject Total	:	150 Marks

A) PRINTING -

I Introduction

Historical background of printing of textiles

Preparation of cotton fabric for printing

II Styles of Printing

III Methods of Printing

General Classification of methods of printing

Flat bed and Rotary screen printing machines

IV Printing paste:-

Printing paste ingredients and their functions

V Printing with direct dye

Print paste ingredients for direct and discharge styles of printing.

VI Printing with reactive dyes

Print paste ingredients for direct, discharge and resist style of printing.

VII Pigment printing

Print paste ingredients and their functions.

VIII Printing with disperse dyes

Print paste ingredients for direct, discharge and resist style of printing.

IX Special print recipes for garments

Khadi, Metallic, Floc, Plastizol, Reflective, Pearl prints.

X Inkjet / Digital printing

Basic principles, Mechanism of printing

Advantages and disadvantages of inkjet printing

B) FINISHING

I. **Introduction –** Objects of finishing, Importance of finishing, classification of finishes, Difference between finishing of woven fabric, Knit goods, and Readymade garments.

II. **Resin Finishing –** Mechanism of resin finishing, concept of anti crease, wash-n-wear and durable press finish.

III. **Finishing of Synthetic Materials –** Heat setting and weight reduction of polyester

IV. **Functional finishes for garments –** concept of garment finishing, Soil release finish, water repellent and flame retardant finish, anti microbial finish, Anti static finish. Difference between pre-garment stage and readymade garment stage finishing,

Finishing of woven / knitted garments, various softening treatments, water resistant breathable finish, Bio polishing, , Deodorizing Finish etc.

V. **Wash down effects on Denim -** Stone Wash, Enzyme Wash, Combined enzyme and stone wash, Acid wash, Antique wash, Ball blast, Whiskering, Sand blast, Ice wash.

VI. **Finishing Machines –** Drum washing machine, hydro extractor, Tumble drier, Pedal dyeing machine

List of Experiments :-

1. Weight reduction to produce silk like finish
2. To identify various types of stains and their removal
3. To test cotton and blended fabrics for dimensional stability (Shrinkage)
4. Resin finishing of garment.
5. Permanent press finishing of garment
6. Softening treatments on garment.
7. Stiffening treatment on garment
8. Bio-polishing treatment on garment.
9. Stone wash on garment.
10. Acid wash on garment.
11. Special printing on garments like Plastizol,khadi, Pearl and Metallic Printing
12. Direct, Discharge and Resist style of printing with reactive dye

13. Direct style of printing with pigments

Reference Books:-

1) Chemical after treatments of textile by Marks, Atlas and Wooding.
2) Textile finishing by A.J. Hall.
3) Introduction to textile finishing by J.T. Marsh.
4) Technology of finishing – Vol. X by Dr. V.A. Shenai.
5) Chemical processing of polyester/cellulosic blends by R.M. Mittal and S.S. Trivedi.
6) Silk dyeing, printing and finishing by Prof. M.L. Gulrajani.
7) Garment Finishing and Care Labelling byS.S.Satsangi, Usha Publishers,53-B/AC-IV, Shalimar Bagh, New Delhi.
8) Stain Removing Techniques by byS.S.Satsangi, Usha Publishers,53-B/AC-IV, Shalimar Bagh, New Delhi.
9) Fabric Care by Noemia D'SOUZA, New Age International Publishers, Daryagang, New Delhi.
10) Textile Printing by L.W.C. Miles.
11) Technology Of Printing by V.A. Shenai.
12) An Introduction To Textile Printing by W. Clark

THIRD YEAR B. TEXT. - SEMESTER-I

5.4. PATTERN MAKING and GARMENT CONSTRUCTION – II (FT)

Lectures	:	3 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam	:	50 Mark
Subject Total	:	175 Marks

1. Stylelines – Introduction to stylelines, The Classic Princess Styleline, Armhole Princess Styleline, The Panel Styleline
2. Cowls – Introduction to Cowls, Types of cowls, Preparing patterns for Back Cowls, Armhole Cowls, Pleated Cowls, Exaggerated Cowls, Inset Cowls
3. Skirts/Circles and Cascades – Types of skirts, skirt lengths, Drafting of flared skirts, gored skirts, godets, wrap skirts, circles, peplums and cascades, skirts with uneven hemlines
4. Grading – Introduction to grading, General principles, Grade Rules, Zero Point and Cardinal Points, Methods of grading: Track grading and nested grading, Grading the basic block and basic skirt, grading of sleeves and collars
5. Draping – Preparation of fabric for draping, Elements of fabrics, Principles and fitting methods, Basic Bodice draping, basic skirt draping, draping of sleeves and collars
6. Pattern Quality Analysis – Relationship between pattern making and quality of the garment, Factors affecting pattern quality, Introduction to computerized pattern making, computerized grading, study of available software for pattern making
7. Sewing of elementary parts – Darts: tapering to fit the garments, tucks and pleats, waistbands, collars, facings, attaching sleeves to the basic bodice
8. Advanced Sewing – Sewing of off-shoulder designs, collars with stand, cowls sewing, sewing skirts, circles and cascades

List of Experiments:-

1. Draft the classic princess styleline using two-dart basic block pattern
2. Draft a pleated shoulder cowl using the basic front pattern block
3. Draft a flared skirt
4. Draft a 6-gore flared skirt.
5. Grade a basic block of size 8 to size 6, 10, 12 and 14 using nested grading.
6. Grade a skirt of size 12 to size 6, 8, 10 and 14 using track grading.
7. Prepare muslin fabric for draping and drape a basic bodice on the body form.
8. Prepare muslin fabric for draping and drape any skirt on the body form.
9. Stitch the following patterns and check the test fit:
    a. Collar with Stand
    b. Shawl Collar with facing
10. Stitch the following:
    a. Attach a waistband and zipper to a skirt
    b. Attach a sleeve to the basic bodice
11. Stitch the following patterns:
    a. The classic princess styleline bodice
    b. Pleated shoulder cowl

Reference Books:-

1. Pattern making for fashion design, Helen Joseph Armstrong, Pearson Education, ISBN: 81-378-0938-8
2. Pattern Grading for Women's Clothes, Gary Cooklin, Blackwell Publishing, ISBN: 978-81-265-2281-1
3. The Art of Fashion Draping, Amaden Crawford, Fairchild Books, ISBN: 81-8710-735-9
4. Professional Sewing Techniques for Designers, Julie Cole and Sharon Czachor, Fairchild Books, ISBN:978-1-56367-516-4
5. Ultimate Sewing Bible, Marie Clayton, Collins and Brown, ISBN: 978-1-84340-411-8
6. Apparel Manufacturing Handbook, Jacob Solinger, Bobbin Media Corp.

THIRD YEAR B. TEXT. -SEMESTER-I

5.5 GARMENT PRODUCTION MACHINERY & EQUIPMENTS (FT)

Lectures	:	3 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

I) **History and development of sewing machines:** History of sewing machines and development. Sewing machinery - classification according to bed types, stitch types (hook or looper), material wise (extra light to heavy weight). Introduction to spreading machines and cutting machines - types and functions.

II) **Parts of sewing machines:** Major parts of sewing machinery and functions. Major parts of Single needle lock stitch machine – UBT and non-UBT: stand height, pedal, presser foot, height of needle bar, needle to hook relationship, height of feed dog, normal and reverse feed stitch length, feed timing, presser foot pressure, needle and bobbin thread tension, bobbin winding assembly, belt tension and their adjustment. Sewing machine safety regulations.

III) **Adjustments of major parts:** Sewing needle and sewing thread, thread consumption, thread routing. Adjustment on SNLS UBT: Needle stop position, wiper, thread timing sequence, timing of thread trimmer cam, positioning the moving knife, installation, sharpening, replacing moving knives, adjusting the floating amount of the auxiliary tension disk. Parts, functions and adjustments of Overlock machines: Needle height, feed dog height, differential feed ratio, tilt of the feed dog, position of the upper and lower knives, sharpening of knife and loopers, trouble shooting in over lock.

IV) **Classification and Operation:** Stitch Classification and application, Feed Classification and application, Sewing Needle: Classification and application, Sewing Thread: Classification and application, Sewing machines: Bed classification and application

V) **Work Aids:** Work-aids and attachments as deskilling devices, functions of pullers, guides and folders compensating presser foots- left, right, double; feller, hemmer etc. Collar turning machines, folding machinery. Computer controlled cutting, sewing, folding machinery.

VI) **Spreading and Fusing:** Manual and automatic spreading, features and specifications, fusing and pressing machinery. Application according to use.

VII) **Latest developments:** Latest developments in production machinery, automatic spreading, cutting, fusing, pressing and sewing machines.

List of Experiments:-

1. Study of various types of cutting machine for the working and construction.
2. Study of various types of cutting machine for the working and construction.
3. Study the various types of beds of the sewing machines.
4. Study the major parts of sewing machines.
5. Study of Needles for the sewing machine.
6. Study of sewing threads.
7. Study of single needle sewing machine for working and construction.
8. Study of overlock sewing machine for working and construction
9. Study of special sewing machines for working and construction.
10. Study of feed off the arm machine for working and construction
11. Work aids and attachment for sewing machine.
12. Visit to garment unit.

Reference Books:-

1. Jacob Solinger., “Apparel Manufacturing Handbook ", Van Nostrand Reinhold Company (1980).
2. Peyton B .Hudson., " Guide to Apparel Manufacturing ", MEDIApparel Inc (1989) ISBN: 0 -945116-08-X.
3. Carr.H, Latham. B., “The Technology of Clothing Manufacture ", Blackwell Scientific Publications (1988).

THIRD YEAR B.TEXT.– SEMESTER- I

5.6 FASHION ART & DESIGN (FT)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

I) **Introduction to Fashion:**

Fashion Terminology - Fashion, Fad, Trend, Classic, High Fashion, Mass Fashion, Fashion Cycle, Adoption of Fashion Products by Diffusion Theory - Innovation, Communication, Adoption and Diffusion, Fashion Theories – Trickle up, Trickle down and Trickle across.

II) **Fashion Design Process:**

Flowchart, Analyzing, Innovational opportunities, Research Inspirations, Research direction, Designing process, Prototyping and Collections, Promotion, Portfolio, Fashion careers.

III) **History of Fashion:**

Brief overview of historical Greek costumes, Egyptian costumes, Roman Costumes, Costumes of Byzantine Era and English Costumes. Study of historical Indian costumes, Detailed Study of 20th Century Fashion- Effect of World War I and World War II on fashion, and Fashion in late 20^{th} century.

IV) **Study of Latest Fashion:**

Study of Latest Fashion Designers - French, Italian, American, Indian and English. Study of Latest Fashions – Based On Age, Sex, Nationality, Occupation, Socio Economic Status.

Study of contemporary textiles and costumes of different states like Kashmiri shawls, Kancheepuram and Baluchari saris, Paithani saris, Bandhani, Patola, Ikkat, and Kalamkari.

V) **Study of Design Details:**

Study of different types of necklines, sleeves, collars, cuffs, pockets, and skirts. Suitability of these design details to various types body

shapes and sizes like Hourglass, Triangle, Inverted Triangle, Rectangle, Petite, Plus size etc.

VI) **Dress and Image:**

Dress as Non-verbal communication, Dress and Image, Gender and Sexuality, Dress in human interaction, Dress in workplace, Race, Ethnicity and Social Class.

List of Experiments :-

1. Study of various types body shapes and sizes.
2. Study of different types of necklines.
3. Study of different types of sleeves.
4. Study of various types of cuffs.
5. Study of different types of pockets.
6. Study of different types of collars.
7. Study of historical Greek costumes.
8. Study of historical Egyptian costumes.
9. Study of historical Roman costumes.
10. Study of various types of saris of different states.
11. Study of latest Indian fashion.
12. Study of current world fashion.

Reference Books:-

1. Kathryn McKelvey and Janine Munslow, “Fashion Design: Process, Innovation and Practice”, Blackwell Publications., ISBN 8126522984.
2. Nirupama Pundir, “Fashion Technology: Today and Tomorrow”, Mittal., 2007, ISBN 8183242030
3. Peter McClaud, “Past and Present Trends in Fashion Technology”, Abhishek Publications, ISBN 9788182473522
4. Gladys Shultz, “How to be a Fashion Designer”, Kessinger Publishing, 2010, ISBN 1164476912.
5. Sharada Dwivedi, “Abu Jani and Sandip Khosla: A Celebration of Style” , AJSK Publications, 2000, ISBN 819012370X
6. Auguste Racinet , “The Complete Costume History”, Taschen Publication, 2006, ISBN 3822850950

7. Elizabeth Rouse, “Understanding Fashion”, Blackwell Scientific Publication, Oxford, 1989. ISBN:0632018917.
8. Mary Lynn Damhorst, Kimberly A. Miller, Susan O. Michelman, “The Meanings of Dress”
9. Russel Gillow, Nicholas Barnard, “Traditional Indian Textiles”, Thames and Hudson Ltd., London, 1991.
10. Hatanaka kokyo Collection –“Textile arts of India”, chronide Books, 1996
11. S.N Dar, “Costumes of India and Pakistan”, D.B Tataporevala sons and co. Ltd., 1982.
12. Churye G.S, “Indian Costume”, Ramdas Bhatkal for Popular Prakashan Pvt. Ltd., Bombay, 1995.
13. Corter Ernestine, “The Changing World Of Fashion”, Om Book Service, 1900 to present.

THIRD YEAR B.TEXT. - SEMESTER - II

6.1 TEXTILE ELECTRONICS-II (TT/MMTT/TPE/TC)

Lectures	:	3 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Practical Exam.	:	50 marks
Term work	:	50 marks
Subject Total	:	200 marks

1) Digital Electronics and Number System

Digital Circuits:- Introduction to Multiplexers, Demultiplexers, Encoders, decoders, Flip Flop – R-S, D and J – K, Registers Latches, binary counter, buffers, Tri-state devices,

Memory- types- RAM, ROM, EPROM.

Introduction to Number systems: Decimal, Binary, Hexadecimal,

conversion of numbers from one system to other.

Binary arithmetic – addition, subtraction, two's complement representation.

2) 8085 Microprocessor

Introduction to microprocessor, features of 8085, Architecture of 8085 – Register section, ALU, Timing and Control etc., Demultiplexing of address and data bus. Generation of control signals.

3) Programming of 8085

Instruction classification, instruction and data formats, addressing modes, complete instruction set, assembly language programming , Execution of programs, programming with looping, counting and indexing techniques Time delay's and counters.

4) Stacks and Subroutine

Stack, subroutine, call and Return instructions, advanced subroutine concepts.

5) Interfacing Input / output devices

Basic interfacing concept, interfacing output displays, interfacing input devices, difference between peripheral Input/output mapped I/O and memory mapped I/O.

6) Interrupts

Concept of interrupts, software and hardware interrupts, Description of

interrupt process, vectored interrupts.

7) Interfacing of peripherals and other I/O devices

8255 PPI interfacing and programming, interfacing of keyboard (matrix) and display, interfacing of thumbwheel switches, stepper motor, D/A and A/D converters, Relays etc.

8) Introduction to Microcontroller

Introduction to microcontroller, Block diagram of microcontroller,

Difference between microprocessor and microcontroller, Features of 8051 microcontroller, Introduction to PLC and its applications.

9) Applications of Microprocessor in Textiles

Use of Microprocessor / Microcontroller in Sizing Machine, Jet dyeing machine, advanced looms, Spinning machines, Ring data System, Auto levelers, On-line monitoring systems, Evenness tester.

List of Experiments :-

1) Study of Number Systems.
2) Study of universal gates.
3) Study of flip flops
4) Assembly language programms (6 to 8)
5) Interfacing of 8255 in simple I/O mode and BSR mode.
6) Interfacing of Seven segment display
7) Interfacing of stepper motor.
8) Interfacing of D/A converter.
9) Interfacing of A/D converter.
10) Interfacing of thumbwheel switch.

Reference Books:-

1) Digital Principles and applications by Malvino and leach
2) Microprocessor Architecture, Programming and applications with 8085 by Ramesh Gaonkar.
3) Microprocessor and Digital system by Douglas Hall.
4) Fundamentals of microprocessors and microcomputers by B. Ram
5) The 8051 Microcontroller Architecture, Programming and Applications by Kenneth J, Ayala.
6) Machine manuals of USTER, LOPHE, PREMIER
7) Electronic Controls for Textile Machine – Hiren Joshi and Gouri Joshi, NCUTE

THIRD YEAR B. TEXT - SEMESTER-II

6.2 MAN MADE FIBRES & YARNS (TT)

Lectures : 3 Hrs / Week

Theory Paper : 100 Marks

Subject Total : 100 Marks

MAN MADE FIBRES:-

Viscose Rayon: - Process of manufacturing viscose fibre / filament yarns, physical and chemical properties of viscose rayon, applications of viscose fibres.

Tencel Fibre: - Manufacturing process, properties and applications.

Polyester Fibres:- Raw materials, manufacturing details of PET fibre / yarns, Properties and applications of PET fibres.

Polyamide Fibres:- Raw materials and manufacturing process of Nylon 6 and Nylon 6,6, fibres and filament yarns, physical , chemical properties and applications of nylon fibres.

Polypropylene Fibres: - Manufacturing process of polypropylene fibres and filament yarns. Dope dyed PP fibres, properties and applications of polypropylene fibres.

Acrylic Fibres: - Comparison of acrylic and modacrylic fibres, manufacturing process, properties and applications of acrylic fibres.

TEXTURISING:-

Definition and concept of texturising, classification and characteristics of textured yarns

False Twist Texturising:- Methods of production of stretched(single heater) and modified stretched (double heater) yarns by conventional methods.

Draw Texturising concept, sequential and simultaneous draw texturising, Study of simultaneous draw texturising process. Draw Texturising Machine Details: - Machine profiles, Twisting devices, Heaters, Cooling devices, Coning oil application, Process variables, Defects in draw textured yarns. Quality of draw textured yarns, technological developments in draw–texturising technology. Double density machine and multiple input shaft machines,

Air Jet Texturising:- Principle of loops formation, Air-jet texturising machine, air- jets, wetting systems, stabilizing devices, process variables in air texturising, Quality of air textured yarns, blending of filaments in air texturising.

Other methods of texturising:-

Edge crimping, Stuffer box crimping, Knit-de-knit, Gear Crimping, Chemical Texturising

BLENDS SPINNING:-

Fibre characteristics and spinnability, fibre properties and end uses, objectives of blending, measures of blending, migration, tinting, selection of blend constituents, and mechanics of blending, blending techniques, and modification of cotton spinning machineries for processing of manmade fibres. Prediction of blended yarn strength.

Common faults in blended and 100% man made spun yarn. Blending of manmade fibres with wool. Processing of manmade fibres and its blends on Rotor Spinning Machines. Spinning of dyed fibres

Reference Books :-

1) Manufactured Fibre Technology, Edited by V. B. Gupta and V. K. Kothari (1997) Chapman and Hall, London.
2) A.A.Vaidya, Production of Synthetic Fibres, Prentice Hall of India Pvt. Ltd., New Delhi 1988.
3) V.B.Gupta and K.K.Kothari (Ed), Man-made Fibres Production, Processing Structure, Properties and Applications, Vol. I and II, Dept. of Textile Technology, IIT, New Delhi 1988
4) Production and Applications of Polypropylene Textiles – O. P. Rajgrat and F. Sevicik.
5) R.W. Moncrieff, Man-Made Fibres, 6th ed. (1975); J.J. Press
6) Textile Fibres - Vol.I, Dr. V. A. Shenai, Sevak Pub. 1990, Mumbai
7) NCUTE – Training Programme Book of Papers on Man Made Fibres.
8) Yarn Texturing Technology by J.W.S. Hearle, L. Hollick, D.K. Wilson Woodhead Publishing Ltd, England.

9) Textile Yarn, Technology, Structure and Application" – Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Interscience publication, 1977, U.S.A.

10) Wilson D.K. and Kollu T., "Production of Textured Yarns by the False Twist Technique", Textile Progress, Vol. 21, No.3, Textile Institute, Manchester, U.K.,1991.

11) Wilson D.K. and Kollu T., "Production of Textured Yarns by Methods Other than False Twist Technique", Text. Prog., Vol. 16, No.3. Textile Institute, 1981.

12) Gupta V.B. (Edr.), "Winter School on Man-made Fibers – Production, Processing, Structure, Properties and Applications", Vol. 1, 1988.

13) Hes L. Ursiny P., "Yarn Texturing Technology", Eurotex, U.K., 1994.

14) Yarn Texturising Technology – J. W. S. Hearle, Wilson, Woodhead Publishing Ltd., England.

15) K R Salhotra , "Spinning of man made fibres and blends on cotton systems", The zextile Association, India 2004.

THIRD YEAR B. TEXT - SEMESTER-II

6.3 UTILITY ENGINEERING IN TEXTILE (TT/MMTT)

Lectures	:	3 Hrs / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

Section - I

1) Humidification in Textile Mills:-

Need for humidification in Textile Mills, Ambient conditions required in various departments of a textile mill. Psychrometry - definition, interrelations of various properties , Psychrometric chart and its use, various psychrometric processes like cooling, heating, humidification, de-humidification, etc. Aspects of evaporating cooling method and refrigerative cooling method. Study of arrangements and layout of standard humidification methods for spinning, weaving and knitting processes – Return air ducts, Return Air Plenum, Filters, Return Air fans, Dampers, Supply Air Fans, Washers, Eliminators, Supply Air Plenum, Supply Air Duct, Diffusers etc. Study of the construction of each component.

Design considerations for a humidification plant and air circulation systems, Calculations related to the heat load in the department, air circulation and the design features of the plant such as fan capacity, Sizes of Dampers, Washers, Ducts, Return Air and Supply Air openings in the department. Automatic controls in humidification plants. Study of recent developments in humidification plant used in spinning, weaving, knitting departments.

2) Pumps, Compressors and Fans used in Textile Mill:-

Classification and characteristics of various types of pumps. Study of types of pumps used in textile mills

Compressors: - Compression methods, intermittent, continuous. Classification of compressors and brief study of construction, working, advantages, limitations of each type. Compressed air requirement in Textile mills, Calculation of compressor capacity. Compressor accessories such as reservoir, dryer, lubrication system, filters, cooling towers, etc.

Fans: - Classification, construction and working of different types of fans. Centrifugal, Axial flow and Radial flow. Fan capacity, power and efficiency. Fan selection. Pneumatic conveying of materials in textile mills.

3) Requirement of quality and quantity of water for spinning and weaving mills.

Section – II

4) Selection of Drives:-

Selection of drives, AC and DC motors, starters, losses, efficiency, speed control, of AC and DC motors, vector control, soft starters, inverters for speed control, factors affecting energy consumption in induction motors.

Design features of energy efficient motors, motor capacity calculation for Air compressors, blowers, pumps, hydraulic systems. Motors used in textile industry, operation of compressor and its power consumption and tips.

5) Illumination: Definitions :- Flux, intensity, solid angle, illumination, utilisation, factor, maintenance factor, laws of illumination, numerical problems on illumination, energy efficient systems, energy efficient lamps, standard values of illumination (LUX) for different departments in textile industry. Study of different lamps. Discharge Lamps, Fluorescent Tube, Sodium Vapour Lamp, Mercury Vapour Lamp, Metal halide Lamp, CFL, LED.

6) Energy Management:- Electrical power required in Textile mills. Maximum demand, Average demand, Power factor, Load factor, Calculation related to energy requirement. Methods of power measurement, introduction to power analyzer and tariff. Control of maximum demand for saving. Power factor control for saving. Load factor and saving. Receiving and Distribution of Power in Textiles.

7) High Tension substation Transformers, Capacitors, Switch yard, Panels, etc. Types of cables–sizes andcalculations. Methods of Power distribution in the department. Methods of procuring H.T. supply and policies and charges and deposits based on connected load and maximum demand. Methods of captive generation Brief production to D.G set and furnace oil, calculation of techno-economic viability. Energy Audit - Principle, energy measurement and

energy conservation. Recent developments in energy efficient equipments. Harmonics in supply. Concept of power quality. Concept of payback and investment in the corrective action taken after auditing. Scope for energy audit in various dept. in text. Industry.

8) Renewable energy sources – solar, solar photovoltaic cell, wind energy, Tidal energy, bio-energy, fuel cell.

Reference Books:-

1) Air Conditioning and Refrigeration by Arora and Domkundwar.
2) Air Conditioning and Refrigeration by Khurmi and Gupta.
3) Manual of Humidification – Batliboi Ltd.,
4) Air Conditioning in Textiles by S.P. Patel.
5) Compressors by Royce N Brown.
6) Refrigeration and Air Conditioning by P.L. Ballaney.
7) Refrigeration and Air Conditioning by P. Arora.
8) Utilisation and traction by S.L. Uppal.
9) Power system by V.K. Mehta.
10) Electrical power system by Dr. H.P. Inamdar.
11) Utilisation of electrical power and electric traction by J.B. Gupta.
12) Mill Engineering by Prof. Pudbidri.
13) Electrification in Textile Industry by Willum Style.
14) Planning for Demand side management in electricity sector.TMH,New Delhi.
15) Industrial load management – Theory and practice and simulation by Bjork C.O. – Elsevier the Netharland
16) Electrical Energy Management in Textiel Mills by Nitra, Ghazibad.
17) Energy Management by Ocallagham Paul (Mcgraw Hill books co.England)
18) Textile Eng. Progress by Nissan
19) Energy Conservation – TI – Tex Progress.
20) Electrical Energy Management in Textile Mills – Training Programme.
21) Research Papers of Auditing in Textile Industry are available in the library

THIRD YEAR B. TEXT. - SEMESTER-II

6.4 STRUCTURE & PROPERTIES OF YARNS (TT)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	50 Marks
Subject Total	:	200 Marks

1) Classification and Structure of Yarn: Classification of yarns, Yarn structures- fundamental structural features of yarns. Structurally related performance of yarn.

2) Yarn specifications - Linear density, yarn structural features, fibre content, mechanical and chemical treatment, quality specifications for spun yarn.

3) Twist in yarns: Geometry of twisted yarns, Idealized helical geometry, twist contraction, twist and packing of fibres in yarns, idealized packing and packing in actual yarn. Influence of twist in manmade fibres on other yarn properties.

4) Form and fibre arrangement in twisted yarns: Fibre migration - Ideal migration, Geometrical approach, Tracer fibre technique for estimation of migration, Characterization of migration behavior, Migration in spun and filament yarn, Tension variation as mechanism of migration, frequency and order of migration.

5) Theory of the extension of continuous filament yarns: Simplest analysis of tensile behavior, analysis with transverse forces and lateral contraction, analysis for large extension, prediction of breakage, prediction of load-extension curve. Observed extension and breakage of continuous filament yarn. Terminology and definitions of the same, Breakage effect of twisting method on tensile properties.

6) Mechanical Properties of Yarn: Mechanics of yarn structures, Tensile behaviour of continuous filament yarns. Influence of processing factors on tensile properties, Observed extension and breakage of spun yarns, Experimental studies.

7) Yarn Structure in Relation to the aesthetic and tactile qualities of apparel fabrics, Role of Structure in visual aesthetics, Tactile aesthetics, Comfort in apparel fabrics under conditions of actual use, Role of yarn structure in fabric compression.

8). Blending in staple yarn systems – Purpose of blending, fibre distribution in blended yarn, tensile properties of blended yarns.

List of Experiments:-

1) Study of effect of rate of loading on tensile properties of yarn.
2) Comparison of dry and wet tenacity of yarn.
3) Study of yarn friction.
4) Study of yarn hairiness.
5) Study of yarn abrasion.
6) Study of fibre migration in twisted yarn.
7) Yarn diameter.
8) Effect of change in speed on yarn strength.
9) Study of tensile properties of blended yarn.
10) Twist measurement by optical and twist upto break method.
11) Analysis of variance – length curves and spectrogram.

Reference Books :-

1. Structural mechanics of fibres, yarns and fabrics by Hearle, Grosberg and Backer
2. Textile Yarn by Marindale and Goswami.
3. Properties of fibres, yarns and fabrics by Kaswell.
4. Physical Testing and quality control textile progress, Vol. 23, No.1/2/3 by K.Slater.
5. Principle of textile testing by J. E. Booth.
6. Mario Bona-Textile Quality (Eurotex series).
7. Cotton Testing by Steadman.
8. Physical Testing of Textiles, B. P. Saville.
9. Textile Testing-Fibre, Yarn and Fabric by Dr. Arindam Basu (ATIRA).
10. Testing and Quality Management by Dr. V. K. Kothari (IIT Delhi).

THIRD YEAR B.TEXT. - SEMESTER – II

6.5 YARN FORMING TECHNOLOGY - V (TT)

Lectures	-	4 hrs/week
Practicals	-	3hrs/week
Theory Papers	-	100 marks
Term Work	-	50 Marks
Subject Total	-	150 Marks

A. Rotor Spinning Technology:-

1. Limitation of ring spinning system. Drafting and stages involved in openend spinning – developments of twisting elements of openend spinning.
2. Study of design developments in, Fibre separation and transportation, Fibre deposition and twist insertion, Design aspects of rotor.
3. Developments in rotor drives.
4. Yarns monitoring in rotor spinning.
5. Automation in Rotor Spinning Machine.
6. Structure and properties and applications of rotor yarns.
7. Technological developments in spinning and processing of rotor spun yarns, effect of trash in sliver, improved cleaning at rotor, production of fine rotor yarns, rotor spinning of man mades and blends, speciality yarns on rotor spinning machines, post spinning processing.

B. Air Jet Spinning:-

1. Basic concept, evoluation of air jet spinning.
2. Raw material requirement, stages involved, operating principle of air jet spinning.
3. Principles of MJS, MTS and MVS.
4. Specifications and working of different air jet spinning systems.
5. Yarn properties, process variables, limitations.

C. Friction Spinning:-

1. Operating principle and raw material requirements, stages involved in friction spinning.

2. Working principle of different friction spinning systems.
3. Development in various stages of friction spinning.
4. Yarn properties, application, process variables.

D. Other Unconventional Spinning Techniques:-

1. Introduction to cover spinning, Bobtex Spinning, SIRO spinning, Self- twist spinning, Twistless spinning.
2. Raw material requirements, operating principles and yarn properties produced from these spinning systems.
3. Advantages and limitations of these spinning systems.

E. Yarn Conditioning :-

1. Principle and scope of yarn conditioning.
2. Conditioning procedure, design and operational details of various yarn conditioning systems.

List of Experiments:-

1. Study of Rotor spinning machine – Passage, Gearing and calculations related to Speeds of various organs, Twist, Production, etc.
2. Study of Air Jet spinning – Constructional details, Passage, Driving arrangement and calculations.
3. To analyze the effect of various process parameters on quality of air jet spun yarns.
4. Production of yarn on Air Covering Machine and to study the characteristics of air-covered yarn.

1. 5. Manufacture of SIRO yarn and comparison of the same with ring spun yarn.

5. Manufacture of doubled yarn on TFO and Ring doubling and comparison of yarn properties.
6. To study the effect of process parameters in Draw-Texturising machine on textured yarn quality.
7. To study the effect of process parameters in Air-jet Texturising machine on textured yarn quality.
8. Study of Hollow yarn Doubling – Constructional details, passage of materials, driving arrangement and calculation.
9. Effect of various process parameters on conditioned yarn.
10. Mill visit to study the various process parameters in blend spinning.

Reference Books :-

1) The Textile Institute Manual of Textile Technology – Short staple spinning Series Vol.V – New Spinning System by W. Klein.
2) Trade Literature of Trutzschler, Rieter, Marzoli, cheery Hara, Toyoda, Holligsworth etc.
3) Textile Progress Vol.3, No.2 – A Critical Appreciation of Recent Developments – Yarn Production and Properties by W. Nuttler.
4) The Economics of Science and Technology of yarn production – Vol.-I and II
5) Spinning in 70s by P.R. Lord.
6) Textile progress vol. 10 No.2 – The Production and properties of staple

i) fibre, Yarns made by Recently developed Techniques by L. Hunter.

7) Air jet spinning – Textile Progress, Textile Institute Publication.
8) Hand Book of Yarn Production by P. R. Lord
9) Spun Yarn Technology by Carl A. Lawrence
10) Vol V New Spinning Systems – H. Staldar
11) Open end Spinning – R. Nield
12) Textile Progress Vol 10 No. 2 – Production and properties of Staple fibre yarns made by recently developed techniques by L. Hunter.
13) Textile Progress on open end spinning – C. A. Lawarance
14) Spun Yarn Technology by Eric Oxtoby.
15) Textile Yarns by Martindale and Goswami.

THIRD YEAR B. TEXT - SEMESTER-I

6.6 FABRIC FORMING TECHNOLOGY-V (TT)

Lectures	:	4 hrs/week.
Practicals	:	3 hrs/week.
Theory Paper	:	100 marks.
Term Work	:	50 marks
Subject Total	:	150 marks.

Weft Knitting:

Introduction:

Types of knitted fabrics, their applications, properties and basic structure of warp and weft knitting. Terms and definitions used in knitting. Comparison of knitting with woven fabric with respect to production and properties. Concept of hand knitting. Evolution of knitting from hand to machine knitting. Concept of flat and circular knitting.

Circular Weft Knitting:

a. Knitting cycle and basic elements of knitting. Essential elements of knitting machine – yarn supply arrangement, loop forming arrangement and fabric take down mechanism.
b. Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as :

1. Creel – Construction, types, capacity and their suitability.
2. Yarn feeding – Need, construction, drive, types of positive and negative feeders, stop motions, indicators, tensioners etc.
3. Loop forming mechanism – Knitting cycle, types of needles and their comparison. Study of essential elements of loop forming such as cylinder, sinker, cam, dial, yarn guide.
4. Take down motion – Spreader, Nip roller, cloth roller, Drive mechanism and its types, cloth roller capacity. Machine and material monitoring systems.

Weft Knit Structures:

a. Principle stitches such as Knit, Tuck, Miss and their representation and their effect on fabric properties.
b. Types and properties of knitted fabrics such as single jersey, double jersey (Interlock, Rib and Purl). Manufacturing process of these fabrics. Conditions for the use of delayed and synchronized timings.
c. Fabric analysis method, representation of design, Needle order, Cam order. Basic designs and the derivatives (1. Single Jersey – cross - miss, lapique, longitudinal tuck stripes, plain pique. 2. Rib – milano, half milano, cardian, half cardian, double cardian, Swiss and French double pique. 3. Interlock- Interlock Pique, Texi pique, Pintuck, Interlock super roma, Bourrelet).
d. Concept of colour Jacquards.

Advanced Knitting Process:

a. Relative Technology (Relanit) on circular knitting machines.
b. Concept of mechanical and electronic jacquard.
c. Structure and knitting of fleecy and plush fabrics
d. Concept and mechanism of striper and loop transfer

Weft Knitted Fabric Quality and Calculations:

a. Weft knitted fabric defects and their remedies. Yarn quality requirements
b. Circular weft knitting machine production calculations, fabric weight and Tightness factor. Knitted fabric relaxation concept.
c. Relation between machine gauge and yarn count.

Flat Knitting:-

a. Basic elements and their functions of flat knitting machine. Hand and machine operated flat knitting machines and their knitting actions.
b. Machine operation for various stitches such as Miss, Tuck, Transfer, and Drop Stitch.
c. Design with and without needle selection, bed racking, new formed and transfer loop for hand and power operated machines. Concept of seamless knitting.

Socks and Gloves Knitting:

Basic machines for above items, working principles and types.

Warp Knitting:

Introduction:

Structure, properties and applications of warp knitting. Knitting cycle and basic elements of warp knitting, Essential elements of warp knitting machine like: yarn supply, loop forming and fabric take down mechanism. warp preparation for warp knitting.

Warp Knitting Machine:

a. Passage of yarn through warp knitting machine.
b. Essential elements of warp knitting machine such as yarn supply arrangement, loop forming mechanism and fabric take down mechanism.
c. Knitting cycle of Tricot and Raschel warp knitting machine.

Warp Knitted Fabric Structure:

a. Study and representation of single, two guide-bar and multi guide-bar (Tricot, Raschel) structures.
b. Weft insertion techniques, Terry technique, Sinker pile fabrics, fall plate, cut press techniques.
c. Net fabric manufacturing

Warp Knitted Fabric Quality and Calculations:

a. Warp knitted fabric defects and their remedies. Yarn quality requirements
b. Production calculation on weight and length basis
c. Fabric weight calculation
d. Concept of rack, run-in
e. Relation between machine gauge and yarn count.

List of Experiments :-

1. Study of single jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
2. Study of double jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
3. Study of warp knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
4. Study of flat knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
5. Design setting on single jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
6. Design setting on Double jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
7. Design setting on warp knitting machine- Machine operation, pattern chain and guide arrangements, yarn feeding and take down setting.
8. Knitted fabric analysis.
9. Knitted fabric analysis.
10. Visit to knitting unit.

Reference Books

1. Knitting Technology by Prof. D. B. Ajgaonkar.
2. Circular Knitting by Dr. Chandrashekhar Iyer.
3. Knitting Technology by Mr. D. Spenser.
4. Warp Knitting by Dr. S. Raz.
5. Flat Knitting by Dr. S. Raz.

THIRD YEAR B.TEXT. – SEMESTER-II

6.2 MAN MADE FIBRE SCIENCE (MMTT)

Lectures	:	4 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1. Fibre structure-Requirements of fibre formation- molecular weight and degree of polymerisation-useful limits of polymerization- crystalline and amorphous regions-molecular structure of fibres-morphological models-one phase, two phase, three phase models,-morphology of various fibres.
2. Techniques for investigation of fiber structure
   a. Optical properties of textile fibres- Refractive Index- Double refraction, Birefringence. Optical heterogeneity in fibres-The factors influencing the birefringence of a fibre, Measurement of birefringence -the beckeline method-compensator method-interference microscopy-refractometer method-Significance of birefringence, Optical dichroism and its importance
   b. X-ray Diffraction Investigations-Introduction, Production and origin of X-rays-Bragg's law of x-ray diffraction-crystal structure-miller indices-determination of fibre structural parameters by x-ray diffractometer and fibre diagram techniques-small angle scattering.
   c. Electron Microscopy –Principle of electron microscope- Transmission and scanning electron microscope - Principle, working and applications.
   d. Infrared Spectroscopy –Spectroscopy, Beer-Lambert law, Principles of IR-Spectroscopy, Principle and working of IR spectrophotometer, Applications, IR-Dichroism and its importance
   e. NMR Spectroscopy – Principles of NMR spectroscopy, principle and working of NMR Spectrometer, applications of NMR.
3. Mechanical Properties of Textile fibres
   a. Tensile properties_Terminology, the factors influencing the tensile properties of fibres

b. Effects of variability- variability –weak link effect, Pierces formula-derivation- Spencer Smith theory, Composite specimen effects-variability in practice

c. Elastic recovery-Definitions-Effects of test conditions on elastic recovery of fibres- Mechanical conditioning of fibres-swelling recovery

d. Forces in various directions-bending and twisting of fibres, derivation of flexular and torsional rigidity , shear modulus-shear strength-general elastic deformation-compression

4. Theories of Mechanical Properties-approaches-structural effects in fibres-theories of time dependence-thermodynamic effects, Boltzamann super position principle, creep-stress relaxation, stress-strain curve, dynamic mechanical properties, their measurement and importance.

5. Model theory of viscoelasticity-linear viscoelasticity, viscoelastic models-Features of Eyring model.

6. Fibre Friction- Consequence of friction in textiles, measurement of friction-empirical results-the nature of friction

7. Thermal properties-Introduction-Specific heat capacity, thermal conductivity, structural changes in fibres on heating and setting, Transition in fibres-primary and secondary transitions and their significance, factors influencing them, degradation and decomposition, Thermal expansion of fibres. Principle, working and applications of DSC, DTA, DMA.

   a. Electrical properties: Static electricity-its generation and consequence-measurement of static electricity, Dielectric properties-permittivity, dielectric constant, dissipation factor, power factor, factors influencing the dielectric properties, measurement of dielectric behavior of fibres, Electric resistance-Specific resistance- Mesaurement of resistance-Factors influencing the electrical resistance of fibres.

TERM WORK

Students should complete term work assigned to them on the above topic.

Reference Books :-

1. Fibre Science- Edited by J.M. Preston, Published by the textile institute, Manchester
2. Physical Methods of Investigation of Textiles, Edited by Meredith R. and Hearle J.W.S.-Published by Textile Book published Inc. New York
3. Physics of fibres- An Introductory Survey-Woods H. J. Published by the Institute of Physics-London, 1955
4. Applied Fibre Science- Vol I-Edited by F. Happey published by Academic Press, London
5. Physical Properties of Textile Fibres-Morton W. E. and Hearle J.W.S. published by the Textile Institute Manchester
6. Fibre Microscopy-Stores J. L. published by London National Trade Pr
7. Structure/Property relationship in Textile Fibres-Textile Progress Vol. 20 No. 4 The Textile Institute Manchester
8. Textile Fibres Yarns and Fabrics – Kaswell E. R. published by Reinhold Publishing Corporation- New York, 1954

THIRD YEAR B. TEXT. – SEMESTER – II

6.4 PHYSICAL PROPERTIES OF MAN MADE YARNS AND FABRICS (MMTT)

Lectures	:	4Hours / Week
Practical	:	3Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	50 Marks
Subject Total	:	200 Marks

A. Yarn testing

1. Yarn Number -

Concept, Direct and indirect systems of yarn numbering, Measurement of yarn number: Knowles Balance, Stubbs Balance, Beesley Balance, Quadrant Balance, and Analytical Balance.

2. Twist and Twist Measurement -

Concept, Twist direction, Amount of twist, Twist multiplier/Factor, Function of twist in yarn structure, Twist and yarn strength, Effect of twist in yarn on fabric properties, Measurement of twist in single and double yarns – Straightened fibre method , Twist contraction method, Twist to break test.

3. Evenness of Yarn – Causes of irregularity, Classification of variation, Expression of irregularity - Basic irregularity, Index of irregularity, Addition of irregularities, Measurement of yarn irregularities- Visual examination, Cutting and weighing method, Electronic capacitance principle, Variation of thickness under compression, Photoelectric testers, Analysis of irregularity – V_L – B_L curves, Spectrogram analysis.

Imperfections and classimat faults - Causes of imperfection and Classimat faults.

4. Hairiness in spun yarn - Concept, causes, Measurement of Hairiness- Photoelectric principle, Optical principle.

5. Yarn Strength –

Introduction, terminologies

a) Single thread strength testing- The effect of fibre properties on the yarn strength, factors affecting the tensile properties of textiles, Modes of loading- CRE, CRL, CRT. Different principles of tensile testing of yarns –Pendulum lever principle, Strain gauge transducer principle and Machines working on these principles.

b) Lea Strength - Lea CSP or Break factor and its significance, Description of lea strength tester, Comparison of lea and single thread test results, Ballistic test and its importance.

B) Fabric testing

1. **Sampling of Fabrics.**
2. **Dimensional characteristics** - Length, width and thickness and their measurement, Importance of thickness.
3. **Fabrics particulars** – EPI and PPI, Count of warp/weft , Weight of fabric – weight per unit length, weight per unit area, Warp and Weft crimp, Effect of crimp on the fabric properties, Measurement of crimp, Fabric cover.
4. **Fabric Strength**

   i) Tensile strength testing – Cut strip method, Grab test method, Comparison between strip test and grab test,

   ii) Tear strength test – Different principles of measurement , Elemendrof tearing strength tester.

   iii) Ballistic strength

   iv) Bursting strength

5. **Fabric serviceability**: - Serviceability, wear, abrasion, Factors affecting abrasion resistance, assessment of abrasion damage, the BFT abrasion testing machine, Martindale abrasion tester.

6. **Pilling of fabrics**

   Concept, Mechanism of pilling, Factors responsible for pilling, Effect of pilling, ICI Pill Box Tester.

7. **Fabric Stiffness and Drape**

   Concept, Importance of stiffness and Drape, Measurement of stiffness: Shirley stiffness tester (cantilever test), Heart loop test.

   Measurement of drape by Drape meter, Factors affecting stiffness and drape.

8. **Crease resistance and crease recovery:** Concept, Measurement of crease recovery, Factors affecting crease recovery.

9. **Air permeability**– Concept, Importance, Terms and definitions, Air permeability tester, Factors affecting air permeability.

10. **Water fabric relations**: Concept, Importance, Water proofing and water repellency, Mechanics of wetting, Wetting time test, Spray test, Drop penetration test, Bundesmann test, Water head test.

List of Experiments :-

1. Determination of linear density
2. Twist in single and double yarn
3. Single yarn strength measurement
4. Determination of lea strength of yarn
5. Yarn evenness testing on evenness tester
6. Determination ravelled strip strength test
7. Tearing strength of fabric
8. Abrasion resistance of fabric
9. Stiffness of fabrics
10. Crease recovery angle
11. Drape of fabric
12. Fabric pilling (demo)

Reference Books:-

1. Principles of Textile Testing by J. E. Booth.
2. Physical properties of Textile Fibre by J. W. S. Hearle and Morton.
3. Textile Testing by Skinkle.
4. Handbook of Indian Standards.
5. Quality control and Testing by V. K. Kothari.
6. Textile Testing Vol.I and II by Anagappan and Gopalkrishnan.

THIRD YEAR B. TEXT -SEMESTER-II

6.5 HIGH PERFORMANCE FIBRES AND SPECIALITY YARNS (MMTT)

Lectures	:	4 Hrs / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

HIGH PERFORMANCE FIBRES:-

Introduction to high performance fibres

Carbon Fibres: Introduction, PAN and pitch based carbon fibres – manufacturing, properties and applications. Vapour grown carbon fibre,

Aramid Fibres: Introduction, polymer preparation, spinning of fibres, structure and properties of fibres, applications.

Gel spun high performance polyethylene fibres: - Introduction, manufacture, fibre characteristics and applications, solid state extrusion of high molecular weight polyethylene fibres.

Fully aromatic polyester fibre: fibre manufacture, properties and applications.

Glass Fibres: Introduction, fibre manufacture, properties and applications.

Ceramic Fibres: Introduction, silicon carbide based fibres, Alumina based fibres. Single crystal oxide fibres.

Chemical resistant fibres:

Manufacture, fibre characteristics and applications of following fibres:

Chlorinated fibres: PVDC

Fluorinated Fibres: PTFE, PVF, PVDF and FEP

Poly (entheretherketones): PEEK

Poly (phenylene sulphide): PPS

Poly (ether imide) : PEI

Thermal resistant fibres:

Manufacture, fibre characteristics and applications of PBI, PBO, fibres.

SPECIALITY YARNS:-

Sewing threads – Sewing thread production methods, Characteristics of Sewing threads. Thread packages.

Embroidery Yarns and Laces: -Process sequence, Manufacturing details, properties and applications.

Core/cover yarns- Types, production methods, general properties and applications

Ropes, Cordage and Twines: - Requirements of fibres and yarns for these products, manufacturing process, Structure of yarns, properties of these products.

Melange Yarn: - Concept of producing mélange yarn. Process and sequence used for production of Melange yarn. Suitability of yarn for different end uses.

Hosiery Yarns: - Raw materials for hosiery yarns, Process sequence and process parameters to make hosiery yarns. Properties and applications of hosiery yarns.

Reference Books

1. High Performance Fibres, Edited by J. W. S. Hearle, Published by wood head publishing Ltd., England in association with Textile Institute Manchester.
2. Carbon fibers by J. P. Donnet and R. C. Bansal, Marcel Dekker, New York
3. Hand book of Fibres Science and Technology, High Technology Fibres, Edited by Manachem Lewin and Jack Preston.
4. New fibers. T. Hongu and G. 0. Phillips Ellis Horwood Ltd, Chichester,
5. Kevlar aramid fiber. by H.H. Yang. John Wiley and Sons, Chichester, New York,
6. Mukhopadhyay S. K., “Advances in Fibre Science” The Textile Institute. 1992, ISBN: 1870812379
7. Gupta V.B. Textile Fibres: Developments and Innovations. Vol. 2, Progress in Textiles: Science and Technology. Edited by V.K. Kothari, IAFL Publications, 2000.
8. ‘Sewing Threads’ Textile progress vol.30 No.3/4, by J.O. Ukponmwan, The Textile Inst. Publication.

THIRD YEAR B.TEXT. - SEMESTER - II

6.6. MAN MADE STAPLE YARN MANUFACTURE-IV (MMTT)

Lectures	-	4 hrs/week.
Practicals	-	3 hrs/week.
Theory Paper	-	100 marks.
Term Work	-	50 marks
Subject Total	-	150 marks.

1. Ring Spinning and Yarn doubling:-

- Theory and principle of ring spinning
- Modern development in ring spinning:- development at each stage like drafting , twisting and winding
- Concept of spinning geometry
- Maintenance and performance assessment
- Concept , object , methods of yarn folding and doubling
- Study and limitation of ring spinning and TFO
- Introduction to fancy yarn production

2. Rotor Spinning:-

- Limitations of ring spinning, classification of spinning systems, stages involved in rotor spinning.
- Raw material requirement and preparation for rotor spinning.
- Yarn forming principle, study of constructional details at each stage.
- Process parameters and yarn properties.
- Automation, techno-economics of open end spinning.
- Role of spin finish as delustering agent of manmade fibres in rotor spinning.

3. Unconventional spinning systems:-

a) Friction spinning :-

- Operating principle and raw material requirements, stages involved in friction spinning.
- Working principle of different spinning systems.
- Yarn properties and applications.

b) Air jet spinning :-

- Raw material requirement, stages involved, operating principle.
- Principles and working of MJS, MTS and MVS.
- Yarn properties, process variables, limitations.

c) Other spinning systems :-

- Selfil, Plyfil, Parafil, Bobtex, SIRO spinning system-introduction.
- Raw material requirements, operating principles and yarn properties produced from these spinning systems.
- Advantages and limitations of these spinning systems.

List of Experiments :-

1) Study of ring frame passage, gearing and calculations.
2) Study of ring doubler, passage, gearing and calculations.
3) Study of TFO passage, gearing and calculations.
4) Study of passage, gearing and calculations of rotor spinning.
5) Study of passage, gearing and calculation of air jet machine
6) Manufacturing of air jet spun yarns at different process variables.
7) Study of Air jet spinning machine constructional details and passage.
8) Manufacturing of SIRO / Wrap spun yarns at different process parameters.
9) Study of Hollow doubler / Air covering machine – Passage, driving arrangement and calculations.
10) Comparative study of properties of ring , rotor and air jet yarns.
11) Industrial visit.

Reference Books:-

1) Fundamentals of Spinning – P. Lord.
2) Fundamentals of Spinning Technology - C.A. Lawrance.
3) Trade Literature by Murata, Vijay Lakshmi, Schlafhorst.
4) NCUTE Pilot Programme in Spinning.
5) Advances in Yarn Manufacture- Edited by S.M. Istiaque.
6) Textile Progress in Open End Spinning – C.A. Lawarance.
7) Textile Progress in Friction Spinning – R.V. Mohendragowda.
8) Two for One Twister Technology and Technique – H.S. Kulkarni and HVS Murthy.
9) New Spinning Systems, Short Staple Services, Vol.-V, - H. Stalder.
10) Air Jet Spinning : Textile Progress by Textile Institute

THIRD YEAR B.TEXT. - SEMESTER - II

6.2 TRIBOLOGY (TPE)

Lectures	-	3 hrs/week.
Theory Paper	-	100 marks.
Sub. Total	-	100 marks

1) Basic concept of lubrication –

Definition of Tribology, meaning of lubrication, friction, liquid lubrication, hydrodynamic lubrication, boundry lubrication, hydrostatic lubrication, Dry or solid lubrication etc.

2) Choice of Lubricant Type -

Problem related to lubricant selection, basic types, selection criterion, choice for particular component.

3) Selection of Lubricating Oils :-

Important properties, classification, viscosity, boundary lubrication, oil stability, contamination, Compatibility etc. Synthetic oils, natural oils, emulsions.

Lubricating oils used in textile machines.

4) Study of Greases :-

Nature and composition of grease, grease manufacturing, mechanism of action of grease, properties of grease, advantages and disadvantages, selection and application, methods of application. Anti-seizes and anti scuffing compounds.

Lubricating greases used in textile machines.

5) Solid Lubrication :-

Mechanism of solid lubrication, advantages and disadvantages MoS_2, PTFE, Nylons, Acetals, metals, composites etc. selection of solid lubricants. Solid Lubricants used in textile machines.

6) Gas Lubrication :-

Principles of gas bearings, properties of gas, advantages and disadvantages, examples of gas bearing use.

7) Oil Feed Systems :-

Advantages of oil feed, various systems like total loss system, oil mist system, wick and pad etc. Problems of oil changing, selection of right system.

Lubrication systems used in textile machines.

8) Lubricant Testing and Specifications:-

Object, functional, chemical, physical tests. Standards and specification, precision of tests.

9) Lubricant Monitoring:-

Objects of lubricant monitoring, SOAP, Particle Test and Ferrography, oil monitoring by lab. testing, Spot tests. Testing of grease. Failure investigation.

10) Oil Conservation, Lubricant Handling and Storage -

Handling of used oil, Disposal of emulsions and contaminated oils, Laundering, refining and reuse. Care in lubricant handling, storage and applications.

Reference Books :-

1) Lubrication – by A.R. Lansdown.
2) Recent Advances in Tribology – Proceeding of X National Conference on Industrial Tribology, 1983.
3) Maintenance Management Vol.4, - IMME Publication.
4) Basic Lubrication Theory – by Alastair Cameron.

THIRD YEAR B.TEXT. - SEMESTER - II

6.3 THEORY OF TEXTILE MACHINES-I (TPE)

Lectures - 3 hrs/week.
Theory Paper - 100 marks.
Sub. Total - 100 marks

1) Mechanisms – Introduction – Link, Kinematic pair, kinematic chain, mechanism, inversion. Study of four bar mechanism, single slider crank mechanism, double slider crank mechanisms and their inversions.

Straight Line Mechanisms – Pantograph, Scott Russell mechanism, Peaucellier mechanism, Harts' mechanism, Intermittent motion mechanisms – ratchet and pawl mechanism and Geneva mechanism.

Examples from textile machines – Straight-line motion mechanisms in rapier loom, crank and rack operated straight line motion, planetary straight-line motion and radial cam operated motion, screw traversing motion for rapier movement.

2) Velocity and Acceleration in Mechanisms -

Relative velocity method, velocity diagram for different mechanism, acceleration diagrams for various mechanisms. Coriolis component of acceleration, application of velocity and acceleration diagrams to sley motion. Numerical examples based on velocity and acceleration diagrams.

3) Cams – Types of cams and followers, profile of cam for given characteristics

of follower, specified coutour cams, tangent and circular arc type cams. Spring force on follower, torque on cam shaft. Conjugate cam. Application of cams and cam mechanisms in Textile Machines.

4) Transmission of Motion and Power -

Belt drives – flat, vee and rope belts. Length of belt, velocity ratio, slip, creep, initial tension in belt, limiting tension ratio, centrifugal tension, power transmission, condition for maximum power transmission. Chain drives used in machines.

5) Friction -
   Introduction – types – laws of friction.
   Friction in pivot bearings, Power lost in friction, coil friction – application in yarn tensioning devices, let off motion, yarn friction meters.
6) Study of Roller weighting system and drafting systems -
   Roller weighting in spinning, mechanism of drafting systems.
7) Study of high speed rings, spindles and travelers.
8) Study of yarn tension in spinning.

Reference Books :-

1) Theory of Machines – Dr. R.K. Bansal.
2) Theory of Machines – Ballaney
3) Mechanics of Textile Machines – Hunton
4) Textile Mechanisms – Grosberg
5) Book of Papers of NCUTE Programme.
6) Theory of Machines – Thomas Bevan
7) Theory of Machines – R.S. Khurmi

THIRD YEAR B.TEXT. - SEMESTER - II

6.4 ENGINEERING DESIGN OF TEXTILE MACHINES-I (TPE)

Lectures	-	3 hrs/week.
Practicals	-	2 hrs/week.
Theory Paper	-	100 marks.
Term Work	-	50 marks
Oral Exam.	-	50 marks.
Subject Total	-	200 marks.

1) Introduction to machine design and selection of engineering materials - Concept of machine design, General design procedure, and properties of engineering materials related to design, manufacturing considerations in design.

2) Principal stresses and strains – Normal stress, tangential stress, Principal stresses and planes, Principal strains, Mohr's circle diagram, Theories of failure- Max. Normal stress theory, Max. Shear stress theory, Distortion energy theory (statement only).

3) Design of shaft -
Shafts subjected to axial stresses, bending stresses, torsional stresses and their combination, ASME code for shaft design, material selection for shaft. Design consideration of drafting rollers.

4) Design of keys and couplings -
Muff coupling, rigid flanged coupling and flexible coupling.
Types of keys and their design, design of splines.

5) Design of springs -
Selection of spring material, types of springs, design of helical - tension, compression, torsion springs, design of leaf springs, nipping of leaf springs.

6) Design of joints -
Design of eccentrically loaded bolted, riveted and welded joints.
Effect of gasket, washers in bolted joints, Bolts of uniform strength.

7) Design of pulleys and flywheel -
Function of flywheel, T-M diagram, Max. fluctuation of energy, Flywheel design. Design of flat belt and vee belt pulleys, selection of pulleys.

8) Seals - Types of seals used in reciprocating and rotary motions failure of seals.

9) Introduction to computer aided drafting.

List of Experiments:-

Minimum five design problems based on above syllabus and minimum two assignments based on computer aided drafting.

Reference Books :-

1. Machine Design – R.K. Jain
2. Machine Design – V.B. Bhandari
3. Machine Design – R.S. Khurmi
4. Theory and problems of machine design – Hal. Holoneces and Langhlmaian, (Schaum Series)

THIRD YEAR B.TEXT. - SEMESTER - II

6.5 YARN MANUFACTURING MACHINERY-V (TPE)

Lectures	-	4 hrs/week.
Practicals	-	3 hrs/week.
Theory Paper	-	100 Marks.
Term Work	-	50 Marks
Subject Total	-	150 Marks.

1. Rotor Spinning Technology:-

- Limitation of ring spinning system. Drafting and stages involved in open end spinning – developments of twisting elements in opened spinning.
- Study of design developments in Shivery Delivery section, Fibre separation and transportation, Fibre deposition and twist insertion, Design aspects of rotor.
- Developments in rotor drives.
- Yarns monitoring in rotor spinning.
- Automation in Rotor Spinning Machine.
- Structure and properties and applications of rotor yarns.
- Technological developments in spinning and processing of rotor spun yarns, effect of trash in sliver, improved cleaning at rotor, production of fine rotor yarns, rotor spinning of man mades and blend, speciality yarns on rotor spinning machines, post spinning processing.

2. Friction Spinning :-

- Operating- principle, Classification, Advantages and limitations of friction spinning.
- Dref-II process, Dref-III process. Operating principles and Specification of machines.
- Raw Material requirements, Yam Properties and applications.
- Economics, Research in friction spinning,
- Future prospectus.

3. Air - Jet Spinning :-

- Operating Principle, Raw material requirements, Advantages, limitations
- Specifications, Inter relationship in spinning technologies, Economics.
- Yam properties and applications,
- Research in air - jet spinning, Single and Twin Jet Systems, Principle of vortex spinning- Constructional Details, Advantages and limitations of air - jet spinning, Murata Twin Spinners Future Prospectus .

4. Study of SIRO spun yarn, Self Twist and Twistless spun yarn

5. Texturising

Draw backs of flat filament yarn, scientific principle in twist texturising, Classification and characteristics of textured yarns.

Falst Twist Process:- Introduction, Methods of production of stretched and modified stretched yarns by conventional methods.

Draw Texturising: - Draw Texturising, sequential (False twist process) and simultaneous draw texturising, Study of simultaneous draw texturising process.

Draw Texturising Machine:- Machine profiles, Twisting devices – Various friction twisting units, heaters, cooling devices, coning oil application, process variables, Quality of draw textured yarns. Technological developments in draw – texturising technology.

Air Jet Texturising:- Principle, Air-jet texturising machine, air jets, wetting systems, stabilizing devices, process variables in air texturising, Quality of air textured yarns, blending of filaments yarn in air texturising.

Other Texturising Methods:- Stuffer box crimping, Edge Crimping, Knit-de-knit, Gear crimping, Chemical texturising.

List of Experiments :-

1. Application of tools and gauges used in spinning mills.
2. Study of Rotor spinning – Constructional details and passage of materials –driving arrangement and calculation.
3. Spinning of sample yarn on Rotor spinning machine and testing of yarn properties.

4. Study of Air Jet spinning – Constructional details and passage of materials –driving arrangement and calculation.
5. Manufacture of Air jet yarn and comparison with ring spun yarn.
6. To analyze the effect of various process parameters on quality of Air Jet yarn.
7. Study of constructional details of Draw texturising and Air Jet texturising.
8. Study of process parameters of Draw texturising and yarn properties.
9. Study of process parameters of Air jet texturising and yarn properties.
10. Production of SIRO yarn and its comparison with Ring spun yarn.
11. Mill visit.

Reference Books:-

1) The Textile Institute Manual of Textile Technology – Short staple spinning Series Vol.V – New Spinning System by W. Klein.
2) Trade Literature of Trutzschler, Rieter, Marzoli, cheery Hara, Toyoda, Holligsworth etc.
3) Textile Progress Vol.3, No.2 – A Critical Appreciation of Recent Developments – Yarn Production and Properties by W. Nuttler.
4) The Economics of Science and Technology of yarn production – Vol.-I and II
5) Spinning in 70s by P.R. Lord.
6) Textile progress vol. 10 No.2 – The Production and properties of staple fibre, Yarns made by Recently developed Techniques by L. Hunter.
7) Air jet spinning – Textile Progress, Textile Institute Publication.
8) Hand Book of Yarn Production by P. R. Lord
9) Spun Yarn Technology by Carl A. Lawrence
10) Vol V New Spinning Systems – H. Staldar
11) Open end Spinning – R. Nield
12) Textile Progress on open end spinning – C. A. Lawarance

THIRD YEAR B.TEXT. - SEMESTER - II

6.6 FABRIC MANUFACTURING MACHINARY - V (TPE)

Lectures	:	4 hrs/week.
Practicals	:	3 hrs/week.
Theory Paper	:	100 marks.
Term Work	:	50 marks
Subject Total	:	150 marks.

Weft Knitting

Introduction :

Types of knitted fabrics, their applications, properties and basic structure of warp and weft knitting. Terms and definitions used in knitting. Comparison of knitting with woven fabric with respect to production and properties. Concept of hand knitting. Evolution of knitting from hand to machine knitting. Concept of flat and circular knitting.

Circular Weft Knitting:

a. Knitting cycle and basic elements of knitting. Essential elements of knitting machine – yarn supply arrangement, loop forming arrangement and fabric take down mechanism.
b. Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as :

1. Creel – Construction, types, capacity and their suitability.
2. Yarn feeding – Need, construction, drive, types of positive and negative feeders, stop motions, indicators, tensioners etc.
3. Loop forming mechanism – Knitting cycle, types of needles and their comparison. Study of essential elements of loop forming such as cylinder, sinker, cam, dial, yarn guide.
4. Take down motion – Spreader, Nip roller, cloth roller, Drive mechanism and its types, cloth roller capacity. Machine and material monitoring systems.

Weft Knit Structures:

a. Principle stitches such as knit, Tuck, miss and their representation and their effect on fabric properties.
b. Types and properties of knitted fabrics such as single jersey, double jersey (interlock, Rib and purl). Manufacturing process of these fabrics. Conditions for the use of delayed and synchronized timings.
c. Fabric analysis method, representation of design, Needle order, Cam order. Basic designs and the derivatives (1. Single Jersey – cross - miss, lapique, longitudinal tuck stripes, plain pique. 2. Rib – milano, half milano, cardian, half cardian, double cardian, Swiss and French double pique. 3. Interlock- Interlock Pique, Texi pique, Pintuck, Interlock super roma, Bourrelet).
d. Concept of colour Jacqurds structures.

Advanced Knitting Process:

a. Relative Technology (Relanit) on circular knitting machines.
b. Concept of mechanical and electronic jacquard.
c. Structure and knitting of fleecy and plush fabrics
d. Concept and mechanism of striper and loop transfer

Weft Knitted Fabric Quality and Calculations:

a. Weft knitted fabric defects and their remedies. Yarn quality requirements
b. Circular weft knitting machine production calculations, fabric weight and Tightness factor. Knitted fabric relaxation concept.
c. Relation between machine gauge and yarn count.

Flat Knitting:-

a. Basic elements and their functions of flat knitting machine. Hand and machine operated flat knitting machines and their knitting actions.
b. Machine operation for various stitches such as Miss, Tuck, Transfer, Drop Stitch.
c. Design with and without needle selection, bed racking, new formed and transfer loop for hand and power operated machines. Concept of seamless knitting.

Socks and Gloves Knitting:

Basic machines for above items, working principles and types.

Warp Knitting

Introduction :

Structure, properties and applications of warp knitting. Knitting cycle and basic elements of warp knitting, Essential elements of warp knitting machine like: yarn supply, loop forming and fabric take down mechanism. Warp preparation for warp knitting.

Warp Knitting Machine:

a. Passage of yarn through warp knitting machine.
b. Essential elements of warp knitting machine such as yarn supply arrangement, loop forming mechanism and fabric take down mechanism.
c. Knitting cycle of Tricot and Raschel warp knitting machine.

Warp Knitted Fabric Structure:

a. Study and representation of single, two guide-bar and multi guide-bar (Tricot, Raschel) structures.
b. Weft insertion techniques, Terry technique, Sinker pile fabrics, fall plate, cut press techniques.
c. Net fabric manufacturing

Warp Knitted Fabric Quality And Calculations:

a. Warp knitted fabric defects and their remedies. Yarn quality requirements
b. Production calculation on weight and length basis
c. Fabric weight calculation
d. Concept of rack, run-in
e. Relation between machine gauge and yarn count.

List of Experiments:-

1. Study of single jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
2. Study of double jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.

3. Study of warp knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
4. Study of flat knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
5. Design setting on single jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
6. Design setting on Double jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
7. Design setting on warp knitting machine- Machine operation, pattern chain and guide arrangements, yarn feeding and take down setting.
8. Knitted fabric analysis.
9. Knitted fabric analysis.
10. Visit to knitting unit.

Reference Books :-

1. Knitting Technology by Prof. D.B. Ajgaonkar.
2. Circular Knitting by Dr. Chandrashekhar Iyer.
3. Knitting Technology by Mr. D. Spenser.
4. Warp Knitting by Dr. S. Raz.
5. Flat Knitting by Dr. S. Raz.

THIRD YEAR B. TEXT - SEMESTER-II

6.2 TECHNOLOGY OF DYEING - II (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Subject Total	:	150 Marks

1. **Mass Colouration and Tow Dyeing: -** Mass colouration of polyester and Nylon with different methods colour addition in polymerization, chips coating, Master batch addition, chips dyeings and Injection during Melt Spinning, Mass colouration of acrylic fibre, Tow dyeing of polyester and acrylic. Advantages and limitations of mass colouration.
2. **Theory of Dyeing with Disperse Dye:**- Disperse dyes, dispersions, Dye solubility, size of particles, theory of cellulose acetate dyeing mechanism, Affinity, Temperature influence, Influence of Heat Treatment influences, Polyester dyeing mechanism, Dyeing in vapour phase, Dyeing kinetics with disperse dyes. Dyeing with carriers.
3. **Polyester Dyeing:**- Preparation of fabric for dyeing, Carrier dyeing of Polyester, Industrial practices of carrier dyeing, Advantages and limitations of carrier dyeing, High temperature dyeing process, HT dyeing equipments, Effects of different auxiliaries, Control and rectification of various problems in High temperature dyeing, Oligomers Problem. Thermo fixation Process – Preparation of fabric for dyeing, Preparation of pad liquor, Padding and dyeing, Thermotixatron equipments required for dyeing. Dyeing of micro denier polyester, CDPET and texturised polyester.
4. **Nylon Dyeing:-** Dyeing theory of Nylon, Dyeing with acid and metal complex dyes, leveling agents, swelling agents, High and low temp. dyeing, dyeing with disperse and reactive dyes. Faults and remedies in Nylon Dyeing.
5. **Acrylic Dyeing:**- Preparation of acrylic for dyeing. Dyeing of acrylic fibre, yarn and fabric, Effect of different parameters on dyeing. Effect of different auxiliaries in dyeing. Defitherm process. Dyeing of acrylic with disperse dyes. Stripping of cationic dyes.

6. **Dyeing of Other Synthetic Fibres:**- Dyeing of cellu-acetate and tri acetate, dyeing of modified and unmodified polypropylene, Dyeing of PVA, PVC and polyurethane Fabrics.
7. **Dyeing of Various Blends:**- Batch and continuous dyeing process of poly / cellulose blends, Dyeing of poly / wool, polyester / Acrylic, Polyamide / Wool, Acrylic / Wool, Acrylic / Silk, Dyeing with one colour and two colour synthetic fibre blends Polyamide / acrylic, Dyeing of polyester / modified polyester blend, polyester / Lycra, Acrylic / cellulosic.
8. **Dyeing of special Fabric:**- Dyeing of Knitted goods, Garment dyeing, Terry Towel dyeing, Processing of top dyed goods.

List of Experiment:-

1. Carrier dyeing in OBBD machine.
2. High temperature dyeing in of polyester fabric in H. T. Beaker dyeing machine.
3. Polyester dyeing by thermosol method.
4. Dyeing of P/C blended shirting using disperse / reactive system by exhaust method.
5. Dyeing of P/C blended shirting using disperse / vat system by exhaust method.
6. Dyeing of P/C blended shirting with disperse / reactive method by continuous method.
7. Dyeing of P/C blended shirting with disperse / vat method by continuous method.
8. Dyeing of P/V blend shirting using disperse / reactive by two bath method.
9. Dyeing of P/V blend shirting using disperse / reactive by one bath method.
10. To study the effect of dispersing agent, levelling agent, defoming agent and rate of heating / cooling, fabric speed in dyeing of polyester.
11. Dyeing of polyester / acrylic, polyester / wool blend.
12. Dyeing of Nylon and its blends.
13. Dyeing of garments in garment dyeing machine.

Reference Books :-

1. Textile processing and properties by Tyrone L. Vigo
2. Processing of poly/cotton blends by G. G. Kulkarni and S. S. Trivedi
3. Dyeing of polyester and its blends by Prof. M. L. Gulrajani
4. Chemical processing of synthetic fibres by Dr. K. V. Datya and A.A. Vaidya
5. Technology of dyeing by Dr. V. A. Shenai
6. Chemical technology in the pre treatment process of textile by Dr. S. R. Karmakar.

THIRD YEAR B.TEXT. – SEMESTER-II

6.3 TECHNOLOGY OF PRINTING-II (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Subject Total	:	150 Marks

1. Printing of Polyester

Preparations of 100% polyester fabric for printing,

Paste formulation, selection criteria of dyes, chemistry,

Direct, discharge and resist styles of printing on 100% polyester.

Mechanism of various discharging and resisting agents used in printing,

Shop floor practices, problems and remedies in printing,

2. Printing of Polyester and their Blends

Single dye applications on blended fabrics,

Pigment printing of polyester and P/C blended fabrics,

Selection criteria for binders and synthetic binders,

Fluorescent pigments,

3. Printing of Polyamides

Preparation of Nylon fabric for printing,

Paste formulations, for printing of nylon with acid, metal complex and disperse dyes.

Shop floor practices, problems and remedies in nylon printing

4. Printing of Silk and Wool

Preparation of silk and wool fabric for printing,

Paste formulations for printing of silk and wool with acid, metal complex and reactive dyes, printing with natural dyes.

5. Transfer Printing

Concept of transfer printing,

Selection of paper, ink and dyes for transfer printing,

Introduction of machinery used for printing paper,

Machinery used for transfer printing.

6. Brasso Printing

Concept of Brasso style of printing, paste formulations, commercial practices, Problems and remedies in Brasso printing, Carbonized prints.

7. Carpet Printing

Concept of carpet printing,

Study of machinery used for carpet printing.

List of Experiments :-

1. Direct style of printing on 100% polyester by using disperse dyes
2. White discharge style of printing by using stannous chloride and Rongalite C.
3. Coloured discharge style of printing on polyester using stannous chloride and Rongalite C
4. Resist style of printing using Cupric Acetate on polyester.
5. Brasso style of printing on P/C blends.
6. Transfer printing on polyester.
7. Printing of silk with acid and basic dyes.
8. Printing of wool with metal complex dyes.
9. Printing of P/C blended fabrics by using disperse / reactive dye.
10. Printings of P/C blended fabrics by using disperse / vat dye.
11. Visit to printing unit.

Reference Books

1) Technology of printing by Dr . V. A. Shenai
2) An introduction to textile printing by W Clarke.
3) Textile Printing by L.W.C. Miles.
4) Textile Printing Book of papers by Prof. R.B. Chavan.
5) Processing of silk by Prof. M.L. Gulrajani.
6) Proceedings: Recent advances in Textile Processing lectures/seminar,Dec.1982, I.I.T., Delhi.
7) Colourage, ITB International bulletin on dyeing printing and finishing.

THIRD YEAR B. TEXT. - SEMESTER-II

6.4 PHYSICAL PROPERTIES OF YARNS and FABRICS (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Subject Total	:	150 Marks

A) Yarn testing

1. **Yarn number –** Concept, Direct and indirect systems of yarn numbering – Measurement of yarn number or count by analytical balance, Bessley balance.

2. **Twist and Twist Measurement** – Definition,Twist direction, Amount of twist, Twist multiplier/Factor,Function of twist in yarn structure, Twist and yarn strength, Effect of twist in yarn on fabric properties, Measurement of twist in single and double yarns- Straightened method,Twist contraction method, twist to break test,Take up twist tester, optical method.

3. **Yarn Strength –**

Introduction, Terminologies - The effect of fibre properties on the yarn strength,Factors affecting tensile properties of textiles and results obtained from testing instruments, Modes of loading- CRL, CRT, CRE.

a) Single thread strength testing: - Different principles of tensile testing of yarns, Pendulum lever principle, Strain gauge transducer principle and Machines working on these principles.

b) Lea Strength - Lea CSP or Break factor and its significance –

Description of lea strength tester, comparison of Lea and Single thread strength test results, Ballistic test and its importance.

4. Evenness of Yarn – Causes of irregularity, Classification of variation, Expression of irregularity, Basic irregularity, index of irregularity. Addition of irregularities, Measurement of yarn irregularities, Visual examination, Cutting and weighing method, Electronic capacitance principle, Analysis of irregularity

– VL – BL curves, Spectrogram analysis, Effect of irregularity, Imperfections and classimat faults..

Hairiness in spun yarn-Concept, Causes, Measurement of hairiness - Photoelectric principle, Optical principle.

B) Fabric testing

1. Sampling of Fabrics:-

2. Dimensional characteristics - Length, width and thickness measurement, importance of thickness.

3 Fabric particulars – EPI and PPI, Warp count, Weft count, Weight of fabric – weight per unit length, weight per unit area, Warp and Weft crimp, Effect of crimp on the fabric properties, Measurement of crimp, Fabric cover.

4. Fabric Strength

i) Tensile strength testing – Cut strip method, Grab test method, Comparison between strip test and grab test,

ii) Tear strength test – Different principles of measurement , Elemendrof tearing strength tester.

iii) Ballistic strength

iv) Bursting strength

5. Fabric serviceability: - Serviceability, wear, abrasion, Factors affecting abrasion resistance, assessment of abrasion damage, the BFT abrasion testing machine, Martindale abrasion tester.

6. Pilling of fabrics

Concept, Mechanism of pilling, Factors responsible for pilling, Effect of pilling, ICI Pill Box Tester.

7. Fabric Stiffness and Drape

Concept, Imporatnce of stiffness and Drape, measurement of stiffness: Shirley stiffness tester (cantilever test), Heart loop test,

Measurement of drape by Drape meter, Factors affecting stiffness and drape

8. Crease resistance and crease recovery: Concept, measurement of crease recovery, Factors affecting crease recovery

9. Air permeability– Concept, Importance, Terms and definitions , Air permeability tester, Factors affecting air permeability

10. Water fabric relations: Concept, Importance, water proofing and water repellency, mechanics of wetting, wetting time test, spray test, Drop penetration test, Bundesmann test, Water head test.

List of Experiments:-

1. Determination of linear density
2. Twist in single and double yarn
3. Single yarn strength measurement
4. Determination of lea strength of yarn
5. Yarn evenness testing on evenness tester
6. Determination of unravelled strip strength test
7. Tearing strength of fabric
8. Abrasion resistance of fabric
9. Stiffness of fabrics
10. Crease recovery angle
11. Drape of fabric
12. Fabric pilling (demo)

Reference Books

1. Principles of Textile Testing by J.E. Booth.
2. Textile Testing Vol.I and II by Anagappan and Gopalkrishnan
3. Physical properties of Textile Fibre by J.W.S. Hearle and Morton.

THIRD YEAR B.TEXT. – SEMESTER-II

6.5 TEXTILE PROCESS PLANNING & MANAGEMENT (TC)

Lectures	:	4 hrs. / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1) General :-

- Objectives of dyehouse
- Structure of the organization.

2) Quality aspects :-

- Principle and functions of management.
- Role of HRD in management
- Concept of ISO

3) Setting up of modern process house :-

- Selection of location.
- Selection of site.
- Construction of building for modern process.

4) Norms for machine production:-

- Norms of production for singeing m/c.
- Norms of production for jiggers, jet dyeing and soft flow dyeing M/cs.
- Norms of production for flat bed and rotary screen printing m/c.
- Norms of production for heat setting and other finishes.
- Norms of production for CBR and CDR m/c.

5) Consumption of Water:-

- Consumption of water in pretreatment.
- Consumption of water in dyeing.
- Water consumption measures

6) Consumption of thermal energy:-

- Various fuels used in process houses.
- Consumption of energy in pretreatment
- Consumption of energy in dyeing.
- Consumption of energy in printing.
- Consumption of energy in finishing.

- Energy consumption measures

7) Lighting requirement:-

- Work place and norms of lighting.
- Position of lighting.

8) Costing:-

- Classification of costing.
- Chemical costing per kg. in pre treatment
- Chemical costing per kg. in dyeing.
- Chemical costing per kg. in printing.
- Chemical costing per kg. in finishing.

9) Material Handling :-

- Goals of material handling.
- Material handling and plant layout.
- Material handling equipments.

Term Work

1) Preparation of layout plan and machinery layout for
   a. Package dyeing unit.
   b. 100% cotton woven goods processing.
   c. Synthetic and / or blend processing.
   d. Knit goods processing.
2) Preparation of project report for modern process house.

Reference Books :-

1) Dyehouse management manual by James Park and John Shore
2) Plant-layout and material handling by Fred E. Meyers.
3) Management of Textile Industry by V.D. Dudeja.
4) Management perspectives in textile industry – BTRA.
5) Textile Manufacturing by M.G. Kulkarni.
6) PMR's Textile laws and Policy by Somesekhar B.V. and Dr.Raj Mogili A.

THIRD YEAR B.TEXT. – SEMESTER-II

6.6. PROCESS CONTROL & SAFETY IN CHEMICAL PROCESSING (TC)

Lectures - 3 hrs. / week

Theory Paper- 100 Marks

Subject Total - 100 Marks

1. General :-

- Definition of process and quality control
- Necessity of process control
- Approach towards process control.
- Definition of quality
- Importance of kaizen and bench marking.

2. Quality Control / Assurance:-

- Importance of quality assurance.
- Structure and functions of quality assurance department.

3. Process Control in Pretreatment:-

- Process control parameters for singeing, desizing, scouring, bleaching, mercerizing and continuous bleaching range.
- Problem and remedies in pretreatments.

4. Process Control in Dyeing :-

- Process control parameters for jiggers, padding mangles, jet dyeing m/c., package dyeing m/cs., soft flow dyeing m/cs. and continuous dyeing range.
- Measures to achieve RIGHT FIRST TIME dyeings.
- Problem and remedies in dyeing.

5. Process Control in Printing :-

- Process control parameters for Flat bed screen printing m/c., rotary screen printing m/c.
- Problem and remedies in printing.

6. Process Control in Finishing :-

- Process control parameter for stenters, sanforising, calenders, Drying range.
- Problem and remedies in finishing.

7. Quality Control in Pretreatments

Various Testing methods like –

- Whiteness
- Ash content
- Barium activity number
- Axial Ratio
- Carboxyl group content.
- Copper number
- Weight loss
- Fluidity
- Norms for the above testing of bleaching and mercerizing processes.

8. Quality control in dyeing and printing -

Various testing methods like –

- Light
- Washing
- Rubbing
- Sublimation.
- Perspiration
- Norms for the above testing of dyeing and printing.

9. Quality control in finishing -

Various testing methods like –

- Iodine absorption.
- Crease recovery angle
- Bending length
- Norms for the above testing of finished methods. .

10. Accidents -

- Factors responsible for accidents in textile mills.
- Factors affecting health or safety of workers or health hazards like flooring, machinery, lighting, drainage, maintenance, material handling, plant – layout and storage.

11. Safety -

- Electrical safety
- Use of safety aids.

- Different chemicals used in wet processing, their safe norms, safe handling and safety measurement.

Reference Books:-

1. Testing and Quality Management – Vol.-I by Dr.V.K. Kothari IAFL Publication, S-351, Greater Kailash Part-I, New Delhi.
2. Norms for the textile industry Part-III – booklet published by ATIRA, Ahmedabad.
3. Norms in textile industry – ATIRA, BTRA, SITRA, NITRA.
4. Industrial quality by Lawrence S. Aft published by St. Lucie Press, Washington D.C.
5. Industrial Safety and Control Handbook, published by National Safety council and Associate (Data) Publishers Pvt. Ltd.,
6. Occupational safety and health in the textile industry by textile committee.
7. Occupational health and safety by Dr. V.A. Shenai.

THIRD YEAR B. TEXT.- SEMESTER – II

6.1. FASHION COMMUNICATION (FT)

Lectures – 3 Hrs./Week

Theory Paper – 100 Marks

Subject Total – 100 Marks

1. **Introduction to fashion communication:** Introduction to fashion, communication and promotion, reading and writing fashion, understanding mass media, Communication Concepts and Processes, Writing Skills
2. **Advertising and promotion:** Writing for the media, advertising for fashion promotion, digital technologies and print media for promotion, Advertising Planning :Media Campaigns, Fashion Ads, Consumer's buying behavior in fashion
3. **Fashion Journalism:** Reporting Trends, forecasts, fashion shows, trade fairs and exhibitions, Contemporary issues in fashion, Fashion history, magazine and feature writing
4. **Fashion Photography and Styling:** Digital photography techniques, Photo editing, Modeling and their styling, Digital video editing, Fashion photography for magazines, Professional case study
5. **Visual Merchandising:** Introduction to visual merchandising, Store design and layout planning, exhibition and display design, graphic design
6. **Fashion Organization:** The power of the press, Public relations, trend forecasting, Fashion schools, Modeling agencies, forecasting agencies, The fashion calendar
7. **Apparel Product Development:** Role of media in product development, study of forecasting agencies, global consumer issues, fashion designers and their impact
8. **Models of communication:** Transmission Model, Expressive Model, Communication as display and attention model, Reception model, Harold Laswell's model, Shannon and Weaver's model.

9. **Fashion dress communication:** fashion as social process**-** Cultural system, Fashion system, Negotiation with others, Negotiation with self. Dress and World Religions- ideology and dress, Religion, Dress and Religious Fundamentalism, Dress modesty and sexuality, Religious dress and social change. Dress and Social Change- Innovation, Powerful influences, Conflict, Capitalism.

Reference Books:-

1. Uncovering fashion: fashion communications across the media, Marian Frances Wolbers, Fairchild Books, 2009 - 294 pages
2. Fashion, Media, Promotion: The New Black Magic, Jayne Sheridan, John Wiley and Sons
3. Brannon, E.L. (2005). Fashion Forecasting: Research, Analysis and Presentation. 2nd ed. New York, NY: Fairchild Publishing, INC.
4. Keiser, S.J, Garner, M.B., . (2003). Trend Forecasting. In: Beyond Design: The Synergy of Apparel Product Development. New York, NY: Fairchild Publications, Inc. p91- 119.
5. Dynamics of Fashion – Ellaine Stone
6. Promotstyle / Here and There Apparel View on color
7. Inside Fashion Business Jeanettle Jernow and Kitt Dickeson
8. Mary Lynn Damhorst, Kimberly A. Miller, Susan O. Michelman, “The Meanings of Dress”
9. Barnard M. , “Fashion as communication”
10. McCracken G., “Culture and consumption”
11. Barlo, D.K., “The process of Communication”
12. Barger, A.A. “Sings in Contemporary Culture”
13. Stone, G. P. ‘Appearance and the self”
14. Davis F. “Fashion, culture and identity”

THIRD YEAR B.TEXT. - SEMESTER – I

6.2 ADVANCED STYLING AND FORCASTING (FT)

Lectures	:	3 hrs/ Week.
Theory Paper	:	100 Marks.
Term Work	:	25 Marks
Sub. Total	:	125 marks

1. **Fabric Styling**

   Material Diversity: Role of Conventional and Non-conventional fabrics in fashion products:

   Natural Fibres- Cotton, Wool, Silk, Linen

   Manufactured fibres- Polyester, Nylon, Acrylic, Viscose

   Fibre Alternatives- Organic Cotton, Organic Wool, Hemp, Poly-Lactic Acid, Lyocell

   Fabric Ornamentation: Material used, types, methods of preparation and techniques for the following:

   Controlled crushing: Gathering, Shirring

   Supplementary Fullness: Flounces, Ruffles, Godets

   Systematic Folding- Pleats, Tucks, Smocking

   Filled relieves- Cording, Quilting, and Stuffing

   Structured Surfaces- Using Darts, Mixed Manipulations- Technique Variation, Creative combinations

2. **Fashion Styling:**

   Elements of Style- Accessing styles and trends, elements of style, Achieve Visual balance, making trends

3. **Introduction to Forecasting:**

   Meaning of Fashion, Meaning of Forecasting, The role of a Forecaster, The Precision of the forecast, the fashion industry's components, the fashion time table, Information Network, Fashion cycle as on prelude

4. **The Fashion Forecasting Process:**

   Objectives, trend chasing, fashion curves, forecasting specialties, long term and short term forecasting, consumer research / scan, consumer segmentation, Study of Consumer Behaviour in fashion forecasting process, consumer adoption process, trend analysis, fashion movement -

recycling fashion ideas, forecasting in textile and apparel industries. Avoiding forecasting traps

5. **Colour and Fabric Forecasting:**

   Color Forecasting: Objectives,

   Color Research- Psychology/ Characteristics of color, Color cycles, Color wheel, Color combination, simultaneous contrasts, lights and color, Colour planning inside the textile and apparel industries

   Fabric Forecasting: Objectives, Fashion in fibres and fabrics, sources of innovation in textile development,

   Creating Fashion Story- Target Market, Fashion Story, building mood and visual presentations, researching seasonal trends

6. **Trend Forecasting:**

   Trend multiplication, Fashion geography, fashion off the run way, street fashion, trend identification, analysis and synthesis, trend map, trend boards, Forecasting of Silhouettes.

7. **Sales Forecasting:**

   Real time marketing, Time series techniques, correlation regression techniques, qualitative techniques, blending quantitative and qualitative techniques, business cycle

8. **Process of Reporting and Implementation:**

   Reporting- Qualitative Content, Quantitative Content, Evaluating the Collection

   Implementation- Leadership Theme, Strategic Planning, Specialty Stores

Reference Books:-

1. Kate Fletcher, “Sustainable Fashion and Textile
2. Colette Wolff, “The Art of Manipulating Fabrics”
3. Rita Prerna, “Fashion Forecasting- A mystery or a Method?”, Fair Child Publications
4. Beyond Design Sandra Keiser and Myrna B. Garner
5. Barnard, Malcolm, Routledge, London, “Fashion as Communication”
6. Jessica Mac Clintock, “The Fundamentals of Fashion (Part-4)”
7. Femina Elle Filmfare
8. Promostyl

THIRD YEAR B.TEXT.- SEMESTER-II

6.3 EMBROIDERY & SURFACE ORNAMENTATION (FT)

Lectures	:	3 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Practical Exam	:	50 Marks
Subject Total	:	200 Marks

I) **Introduction**– Definition, History of Embroidery, general rules for hand embroidery, Design transfer techniques, Tools for hand embroidery, Selection of needle, threads and fabrics for embroidery.

II) **Hand embroidery stitches**- running, couching, button hole, satin, long and short, wheat, chain, stem, herringbone, cross stitch, knotted stitches, fish bone etc.

III) **Indian traditional embroideries** – Phulkari, Kasuti, Kashmiri embroidery, kutch work, chikkankari, kantha, tribal embroideries-stitches, designs, colors and materials used.

IV) **Ornamentation Techniques** - Eyelet work, cutwork, Richelieu work, lace work, drawn thread and fabric work, patch work, mirror work, appliqué, shaded embroidery, shadow work, badala work, bead and sequins work, bobbin thread embroidery etc.

V) **Introduction to Machine Embroidery**- History of embroidery machine, Advantages of embroidery machines, Various types of needles, frames, bobbins, Selection of frames to design , Selection of needle thread and bobbin thread and suitable stitches for embroidery using computer.

VI) **Construction and Working of Embroidery machines** – Passage of thread, operation screen, tension switch, needle bar, bar switch, thread breakage indicator, colour change motor, driver box, x-axis and y-axis pulse motor, Care and maintenance of embroidery machine, Timing and setting of embroidery machine. Special types of embroidery machines, Costing, Quality and Care of embroidery goods, latest developments and technical features of embroidery machines.

VII) **Software used for embroideries** – Introduction to various types of embroidery software, process of digitizing, punching tools, different input methods for embroidery software, various types of stitches, improving embroidery quality, Editing and Modifying designs, troubleshooting and corrective actions.

List of Experiments :-

1. Study of historical background motifs, colours, and materials used in embroideries of Phulkari embroidery.
2. Study of historical background motifs, colours, and materials used in embroideries of Kasuti embroidery.
3. Study of historical background motifs, colours, and materials used in embroideries of Gujrat and Kutch embroidery.
4. Study of historical background motifs, colors, and materials used in embroideries of kantha embroidery.
5. Study of historical background motifs, colors, and materials used in embroideries of tribal embroidery.
6. Study of historical background motifs, colors, and materials used in embroideries of Chikankari embroidery.
7. Study of computerized embroidery machine.
8. Study of materials and tools used for machine embroidery.
9. Study of embroidery software.
10. Design development for computerized embroidery.
11. Embroidering of the developed design on machine.
12. Visit to Embroidery unit.

Reference Books

1. Shailaja D. Naik, “Traditional Embroideries of India”, A.P.H Publishing Corporation, New Delhi, 1996.
2. Sheila Paine, “Embroidered textiles”, Thames and Hudson Ltd., 1990.
3. Gail Lawther, “Inspirational Ideas for Embroidery on clothes and Accessories”, Search Press Ltd., 1993.

THIRD YEAR B.TEXT. - SEMESTER – II

6.4 CAD-CAM FOR APPAREL MANUFACTURING (FT)

Lectures	:	3 hrs/week.
Practical	:	3 hrs/week.
Theory Paper	:	100 marks.
Term Work	:	50 marks
Sub. Total	:	150 marks

1. Introduction to computer

Introduction to computer - concepts of CAD / CAM. Usage of CAD/CAM in Garment Manufacturing. Principles of computer graphics, abbreviations and symbols used in CAD systems.

2. Computerized production pattern making

Comparison of manual and CAD systems. Computerized production pattern making – Hardware and software selection for CAD systems. How to produce a sample production pattern. Computer aided manipulation of pattern pieces to create individual styles. Operation of garment CAD software. Computer aided color matching- Computer used for purchase, inventory control and sales, computerization in quality control and production control.

3. Computer aided production planning in Garment Manufacturing

Introduction to finite scheduling concept and fast react software. Creating product and order planning, updating. Eliminate late deliveries - General set up, allowances and matrices, Critical path and time tables. Reports generated by production planning software – production output reports by customer/location/delivery date. Use of microcomputers for production control in garment industry.

4. 3-D Modeling

Intelligent systems - 3D scanning technology. 3D body scanners, Imaging techniques for various designs. Automatic Pattern Generation Systems. 2D to 3D conversion technology. Draping 2D patterns on 3D body forms. Digitizing a pattern and grading of patterns. Drape evaluation of 3D garment simulation.

5. Management Information System in garments Industry

MRP and MRP – II. EDI in garment technology. Concept of Enterprise Resource Planning (ERP) and computerization in exports/ documentation. Future of ERP. Inventory Management.

6. CAM - Computer controlled machinery for garment manufacturing - automated layout planning by various techniques - Algorithm for computer production garment parts, Development of robotics for CAM. Creating marker plan and plotting markers.

7. Recent Developments in CAD/CAM: 3D pattern making systems, WIP control using CAD software, 3D virtual clothing and simulation software

List of Experiments:-

1. To understand the usage of the basic tools available for pattern making in any of the CAD software.
2. Draft the basic block using the tools available in the CAD software
3. Grade the basic block using grading tools available in CAD software
4. Measure and Check the correctness of seams in the patterns
5. To add darts/pleats/notches/folds in the patterns
6. Create marker plan for a set of patterns drafted in CAD
7. To understand the usage of the tools available in fashion designing software
8. To drape a one-piece garment on the models available with the tools available in fashion designing software
9. To drape any party-wear garment on the models available with the tools available in fashion designing software
10. Digitize a manually drafted pattern with the help of digitizer and grade the digitized pattern for all sizes
11. Create a mixed marker plan for all the sizes drafted/graded and plot the pattern with the plotter
12. To make a textile print (sari border / bedsheet / curtain print) with the tools available in Wonder weaves Tex Print

Reference Books:-

1. Winfred Aidrich, “CAD in Clothing and Textiles”, Blackwell Science Ltd., 1994.
2. Patric Taylor, “Computer in the Fashion Technology”, Om Book Service, 1997.
3. Stephen Gray “CAD / CAM in clothing and Textiles ", Gower Publishing Limited, 1998, ISBN 0-566-07673X.
4. Compilation of papers presented at the Annual world conference Sep 26 -29, 1984 Hongkong, “Computers in the world of textiles ", The textile Institute ISBN: 0-0900739-69X.
5. Winifred. Aldrich, " CAD in clothing and Textiles ", Blackwell Science 2nd edition, 1992, ISBN: 0-63 -3893 – 4
6. Jacob Solinger, “Apparel Manufacturing Handbooks ", Van no strand and Reinhold Company, 1980,ISBN:0-442-21904-0.

THIRD YEAR B. TEXT.- SEMESTER-II

6.5 MERCHANDISING IN APPAREL & FASHION INDUSTRY (FT)

Lectures : 4 Hrs / Week
Theory Paper : 100 Marks
Subject Total : 100 Marks

I) **Organization of the Apparel Business -** Introduction to apparel industry - organization of the apparel industry Business concepts applied to the apparel industry.

II) **Marketing –** Fashion marketing, size and structure of fashion market, marketing environment, marketing research, marketing objectives and Strategies, marketing mix, fashion marketing planning, fashion market sourcing- domestic, export manufacturing, retailers/wholesalers/co-operative, Buying agencies/Offices, Direct exporting.

III) **Merchandising –** Introduction to fashion merchandising, categories of apparel merchandising, fashion merchandising process, responsibilities of merchandiser in different organizations, Buying cycles and tools of merchandising – buying cycle, time and action plan, range planning, critical path and product development. Costing techniques and Spec Sheets. Visual Merchandising.

IV) **Retailing:** Organizational structure of retail, Retail research, store location, operation and management, Merchandise distribution, different departments of retailing, supply chain management, customer relationship management

V) **Sourcing -** Need for sourcing, Resource Planning – Global Sourcing Strategies, Supply Chain and demand chain analysis, JIT technology.

VI) **Export Documentation -** Various types of export documents, Pre-shipment Post -shipment documentation, Terms of sale, payment, shipment etc. Export incentives: Duty drawback, DEPB, I / E license - exchange control regulation – (FEMA) foreign exchange management acts - export management risk - export finance. WTO / GATT / MFA - Functions and objectives, successes and failures.

Reference Books :-

1. Merchandising Buying - Bohlinger.
2. Fashion Merchandising- Elaine Stone.
3. Fashion Marketing – Mike Easey.
4. Apparel Merchandising – M. Krishnakumar
5. Fashion Retailing – Allen Diamond.

THIRD YEAR B. TEXT. - SEMESTER-II

6.6 MEN, WOMEN & CHILDREN'S WEAR (FT)

Lectures	:	4 Hrs / Week
Practicals	:	3 Hrs/Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam.	:	50 Marks
Subject Total	:	175 Marks

I) **Study of Children's Wear- I:**

Measurements required for construction of kids and children's wear for various age groups: Newborns, Infants, Toddler, Kids and Children (Boys and Girls)

Selection of fabrics, trimmings, seams for Children's wear

Factors affecting selection

II) **Study of Children's Wear- II:**

Drafting of Children's Basic Bodice and Knickers Block

Patterning and construction of: Baba suit, Baby frock, Shorts, Rompers, Pedal Pushers. Pattern laid rules, common method of layout for asymmetric design, stripes, checks and one way design for children's garments. Fit for children's garments.

III) **Study of Men's Wear- I:**

Patterning, Construction and Economical Layout for:

Men's Boxer Shorts, Formal shirts with regular collar, button down collar- plackets – Back tucks – Centre and Side tucks – Balancing of designs – Asymmetric and Symmetric designs - checks and stripes.

IV) **Study of Men's Wear- II:**

Patterning, Construction and Economical Layout for:

Men's Formal Trouser: Pleated and Flat front with Single and Double Welt back Pockets, 5 Pocket Casual Trousers, Principles involved in fitting.

V) **Study of Women's Wear- I:**

Patterning, Construction and Economical Layout for:

Nighties, Midi skirts (Styles of A-Line, Umbrella and Gored) and Tops, Salwar Kameez and Blouses.

Connecting darts into seams –fitting problems.

Selection of material, thread, color and surface ornamentation for women's Wear

VI) **Study of Women's Intimate Apparels- II:**

Patterning, Construction and Economical Layout for:

Braziers- Finding the Bust Span, Panties, and other lingerie

Use of Elastomeric yarns in lingerie

Different types of fitting for ladies inner wear

List of Experiments:-

1. Patterning and Construction of Romper
2. Patterning and Construction of Baby's Frock
3. Patterning and Construction of Shorts/ Knickers
4. Patterning and Construction of Men's Formal Shirt
5. Patterning and Construction of Men's Formal Trousers
6. Patterning and Construction of Men's Casual Trousers
7. Patterning and Construction of Nighties
8. Patterning and Construction of Ladies Blouse
9. Patterning and Construction of Salwar Kameez

Reference Books:-

1. Helen Joseph and Armstrong, "Pattern Making for Fashion Design", Pearson Publications
2. Harold Carr and Barbara Latham, "The technology of Clothing Manufacture", Blackwell Science Inc., 1994.
3. Singer, "Sewing Lingerie", Cy DeCosse Incorporated, 1991.
4. Singer, "Sewing Active Wear", Cy DeCosse Incorporated, 1986.
5. Singer, "Sewing Pants That Fit", Cowles Creative Publishing Inc., 1989.
6. Cooklin Gerry, "Pattern Grading for Children's", Om Book Service, 1991.
7. Gerry Cooklin, "Garment Technology for Fashion Designers", Blackwell Science, 1997

THIRD YEAR B. TEXT. - SEMESTER-II

6.7 DESIGN COLLECTION & PRESENTATION (FT)

Practicals	:	2 Hrs / Week
Term Work	:	50 Marks
Subject Total	:	50 Marks

List of Experiments:-

1. Previous decade study for colors, silhouettes, fabrics, styles and influences of socio-political and lifestyle causes on fashion: World scenario and Indian scenario.
2. Forecasting for colors, pattern and fabric for the ensuing seasons based on international forecast.
3. Preparation of Inspiration/Story boards/Mood boards.
4. Collections of fabric swatches, laces, braids, linings, wadding, Surface Ornamentations based on forecast done/ existing market trends
5. Design development process: Selection of Seams, Necklines, Collars, Sleeves, cuffs, pockets, Accessories etc.
6. Illustrating Fashion Models for collection development.
7. Development of garment detailing sheet for a selected garment.
8. Pattern Development for a garment out of developed collection.
9. Construction of a garment out of developed collection.
10. Window Display.

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEM – I

MON TO URSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	
l/TP/TC	TEXTILE ELECTRONICS – II	I	TT/MM/TP/TC	TEXTILE ELECTRONICS-I	
	YARN FORMING TECHNOLOGY –III	I	TT	YARN FORMING TECHNOLOGY–IV	
	FABRIC FORMING TECHNOLOGY – III	I	TT	FABRIC FORMING TECHNOLOGY–IV	
I	CHEMICAL PROCESSING OF TEXTILES – II	I	TT/MM	CHEMICAL PROCESSING OF TEXTILES – II	
	STRUCTURE AND PROPERTIES OF TEXTILE FIBRES	I	TT	STRUCTURE AND PROPERTIES OF TEXTILE FIBRES	
ITT	MECHANICS OF TEXTILE MACHINES	I	TT/MMTT	MECHANICS OF TEXTILE MACHINES	
l/TP/TC/FT	INPLANT TRAINING-I	I	TT/MM/TP/TC/FT	INPLANT TRAINING – I	

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEM – II

MMON TO COURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	
M/TP/TC	ADVANCED COMPUTER PROGRAMMING	II	TT/MM/TP/TC	TEXTILE ELECTRONICS – II	
	MANMADE FIBRES & YARNS	II	TT	MANMADE FIBRES & YARNS	
M	UTILITY ENGINEERING IN TEXTILE	II	TT/MM	UTILITY ENGINEERING IN TEXTILE	
	STRUCTURE & PROPERTIES OF YARNS	II	TT	STRUCTURE & PROPERTIES OF YARNS	
	YARN FORMING TECHNOLOGY – IV	II	TT	YARN FORMING TECHNOLOGY – V	
	FABRIC FORMING TECHNOLOGY – IV	II	TT	FABRIC FORMING TECHNOLOGY – V	

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- M.M.T.T. (MAN MADE TEXTILE TECHNOLOGY) SEM – I

SR. NO.	COMMON TO COURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	SEMESTER
1	TT/MM/TP/TC	TEXTILE ELECTRONICS-II	I	TT/MM/TP/TC	TEXTILE ELECTRONICS-I	I
2	MMTT	MAN MADE STAPLE YARN MANUFACTURE – III	I	MMTT	TEXTURISING & BLEND SPINNING	I
3	MMTT	MAN MADE FABRIC MANUFACTURE – III	I	MMTT	MAN MADE FABRIC MANUFACTURE – IV	I
4	TT/MMTT	CHEMICAL PROCESSING OF TEXTILES – II	I	TT/MMTT	CHEMICAL PROCESSING OF TEXTILES – II	I
5	MMTT	PHYSICAL PROPERTIES OF MAN MADE FIBRE & TESTING	I	MMTT	PHYSICAL PROPERTIES OF MAN MADE FIBRE & TESTING	I

6	MMTT	MECHANICS OF TEXTILE MACHINES	I	MMTT	MECHANICS OF TEXTILE MACHINES	I
7	TT/MM/TP/TC/FT	INPLANT TRAINING – I	I	TT/MM/TP/TC/FT	INPLANT TRAINING – I	I

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- M.M.T.T. (MAN MADE TEXTILE TECHNOLOGY) SEM – II

ION TO IRSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	
/TP/TC	ADVANCED COMPUTER PROGRAMMING	II	TT/MM/TP/TC	TEXTILE ELECTRONICS-II	
	MANMADE FIBRE SCIENCE	II	MMTT	MANMADE FIBRE SCIENCE	
TT	UTILITY ENGINEERING IN TEXTILE	II	TT/MM	UTILITY ENGINEERING IN TEXTILE	
	PHYSICAL PROPERTIES OF MAN MADE YARNS & FABRICS	II	MMTT	PHYSICAL PROPERTIES OF MAN MADE YARNS & FABRICS	
	HIGH PERFORMANCE FIBRES	II	MMTT	HIGH PERFORMANCE FIBRES & SPECIALITY YARNS	
	TEXTURISING & SPECIALITY YARNS	II	MMTT	MANMADE STAPLE YARN MANUFACTURE-IV	

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- T.P.E. (TEXTILE PLANT ENGINEERING) SEM – I

MMON TO OURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	
M/TP/TC	TEXTILE ELECTRONICS-II	I	TT/MM/TP/TC	TEXTILE ELECTRONICS-I	
	YARN MANUFACTURING MACHINERY – III	I	TPE	YARN MANUFACTURING MACHINERY – IV	
	FABRIC MANUFACTURING MACHINERY – III	I	TPE	FABRIC MANUFACTURING MACHINERY – IV	
	AMBIENT CONDITIONS IN TEXTILE MILLS	I	TPE	AMBIENT CONDITIONS IN TEXTILE MILLS	
	TEXTILE TESTING	I	TPE	TEXTILE TESTING	
	METALLURGY	I	TPE	METALLURGY	
M/TP/TC/FT	INPLANT TRAINING - I	I	TT/MM/TP/TC/FT	INPLANT TRAINING – I	

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- T.P.E. (TEXTILE PLANT ENGINEERING) SEM – II

IMON TO URSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	
M/TP/TC	ADVANCED COMPUTER PROGRAMMING	II	TT/MM/TP/TC	TEXTILE ELECTRONICS – II	
	TRIBOLOGY	II	TPE	TRIBOLOGY	
	THEORY OF TEXTILE MACHINES – I	II	TPE	THEORY OF TEXTILE MACHINES – I	
	ENGINEERING DESIGN OF TEXTILE MACHINES – I	II	TPE	ENGINEERING DESIGN OF TEXTILE MACHINES – I	
	YARN MANUFACTURING MACHINERY – IV	II	TPE	YARN MANUFACTURING MACHINERY – V	
	FABRIC MANUFACTURING MACHINERY – IV	II	TPE	FABRIC MANUFACTURING MACHINERY - V	

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- T.C. (TEXTILE CHEMISTRY) SEM – I

)MMON TO COURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	S
1M/TP/TC	TEXTILE ELECTRONICS-II	I	TT/MM/TP/TC	TEXTILE ELECTRONICS-I	
	TECHNOLOGY OF DYEING – I	I	TC	TECHNOLOGY OF DYEING – I	
	TECHNOLOGY OF PRINTING – I	I	TC	TECHNOLOGY OF PRINTING – I	
	TECHNOLOGY OF FINISHING – I	I	TC	TECHNOLOGY OF FINISHING – I	
	CHEMICAL ENGINEERING OPERATIONS	I	TC	CHEMICAL ENGINEERING OPERATIONS	
	PHYSICAL CHARACTERISTICS OF TEXTILE FIBRES	I	TC	PHYSICAL CHARACTERISTICS OF TEXTILE FIBRES	
1M/TP/TC/FT	IMPLANT TRAINING - I	I	TT/MM/TP/TC/FT	INPLANT TRAINING – I	

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- T.C. (TEXTILE CEMISTRY) SEM – II

SR. NO.	COMMON TO COURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	SEMESTER
1	TT/MM/TP/TC	ADVANCED COMPUTER PROGRAMMING	II	TT/MM/TP/TC	TEXTILE ELECTRONICS – II	II
2	TC	TECHNOLOGY OF DYEING-II	II	TC	TECHNOLOGY OF DYEING-II	II
3	TC	TECHNOLOGY OF PRINTING – II	II	TC	TECHNOLOGY OF PRINTING – II	II
4	TC	TECHNOLOGY OF FINISHING – II	II	TC	TECHNOLOGY OF FINISHING – II	II
5	TC	TEXTILE PROCESS PLANNING & MANAGEMENT	II	TC	TEXTILE PROCESS PLANNING & MANAGEMENT	II
6	TC	PROCESS CONTROL & SAFETY IN CHEMICAL PROCESSING	II	TC	PROCESS CONTROL & SAFETY IN CHEMICAL PROCESSING	II

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- F.T. (FASHION TECHNOLOGY) SEM – I

SR. NO.	COMMON TO COURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	SEMESTER
1	FT	TEXTILE ELECTRONICS-II	I	FT	TEXTILE ELECTRONICS	I
2	FT	STRUCTURE & PRODUCTION OF KNITTED FABRIC	I	FT	STRUCTURE & PRODUCTION OF KNITTED FABRIC	I
3	FT	GARMENT PROCESSING	I	FT	GARMENT PROCESSING	I
4	FT	TESTING OF TEXTILES & APPARELS	I	FT	PATTERN MAKING & GARMENT CONSTRUCTION	I

					-II	
5	FT	GARMENT PRODUCTION MACHINERY & EQUIPMENTS	I	FT	GARMENT PRODUCTION MACHINERY & EQUIPMENTS	I
6	FT	FASHION ART & DESIGN	I	FT	FASHION ART & DESIGN	I
7	TT/MM/TP/TC/FT	IMPLANT TRAINING - I	I	TT/MM/TP/TC/FT	INPLANT TRAINING – I	I

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EQUIVALENCE OF SUBJECT AT THIRD YEAR B. TEXT. TO REVISED TEXTILE COURSES.

THIRD YEAR B.TEXT.- F.T. (FASHION TECHNOLOGY) SEM – II

SR. NO.	COMMON TO COURSE	PRE-REVISED SUBJECTS	SEMESTER	COMMON TO COURSE	REVISED SUBJECTS	SEMESTER
1	FT	ADVANCED COMPUTER PROGRAMMING	II	FT	CAD-CAM FOR APPAREL MANUFACTURING	II
2	FT	FASHION ILLUSTRATION	II	FT	ADVANCED STYLING & FORCASTING	II

3	FT	EMBROIDERY & SURFACE ORNAMENTATION	II	FT	EMBROIDERY & SURFACE ORNAMENTATION	II
4	FT	HOME TEXTILES IN FASHION	II	FT	FASHION COMMUNICATION	II
5	FT	MERCHANDISING IN APPAREL & FASHION INDUSTRY	II	FT	MERCHANDISING IN APPAREL & FASHION INDUSTRY	II
6	FT	MEN, WOMEN & CHILDREN'S WEAR	II	FT	MEN, WOMEN & CHILDREN'S WEAR	II
7.	FT	DESIGN COLLECTION & PRESENTATION	II	FT	DESIGN COLLECTION & PRESENTATION	II