

REVISED SYLLABUS W.E.F.01ST JULY, 2006

S.Y.B.TEXT. (MMTT) SEMESTER-I

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB. TOTAL
3.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS -I	3	---	---	2	100	25	---	50	175
3.2	TT/MMTT/TPE/TC	TEXTILE MATHEMATICS-III	3	---	---	---	100	---	---	---	100
3.3	MMTT/TC	* POLYMER SCIENCE	3	---	---	---	100	---	---	---	100
3.4	MMTT	MANMADE FIBRE MANUFACTURE-I	4	---	---	3	100	25	---	50	175
3.5	MMTT	MANMADE STAPLE YARN MANUFACTURE-I	4	---	---	2	100	25	---	---	125
3.6	MMTT	MANMADE FABRIC MANUFACTURE-I	4	---	---	2	100	25	---	---	125
			21	---	---	9	600	100	---	100	800

Note : *Indicates modified revised

L =LECTURES

T =TUTORIALS

DR=DRAWING

PR=PRACTICALS

TP=THEORY PAPER

TW=TERM WORK

OE=ORAL EXAMINATION

PE=PRACTICAL XAMINATION

SECOND YEAR B.TEXT. – SEMESTER - I

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

Lecturers	:	3 hrs/week
Practical	:	2 hrs/week
Theory paper	:	100 marks
Term work	:	25 marks
Practical Exam.	:	50 marks
Subject Total	:	175 marks.

- 1) **Electronics Components** :- Introduction to Electronics, applications of electronics, electronics components, passive components, resistors, colour coding of resistors, variable resistors, capacitors, colour code used for capacitors, variable capacitors, inductors, active components.
- 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, Π 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) **Feedback in Amplifier & Op-Amp.** :- Concept of feedback in amplifier, Types of feedback, voltage gain of a feedback amplifier advantages of negative feedback. Amplifier circuit with negative feedback.
Op-Amp :- Introduction, block diagram, symbol, ideal op-amp, open loop, op-amp configuration, op-amp with negative feedback, IC741-pinout & specifications. Applications.

5) **Power Semiconductor Devices and Applications :-** SCR construction, Principle of operation, two transistor analogy, turning ON & OFF of SCR, SCR characteristics.

Triac.-Construction, working & characteristics. Diac- construction, working & characteristics.

UJT - Construction, working & characteristics. UJT as Relaxation Oscillator. Application of SCR – SCR Converter, SCR in DC Motor speed control. Triac in AC power control.

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 transducers, secondary transducers, electrical transducers active & passive transducers, analog & digital transducers, advantages of electrical transducer, Basic Requirements of a transducer.

Primary Transducers for pressure measurement – Diaphragm bourdon tube, Bellows.

Temperature Transducers – Resistance temperature Detector (RTD), Thermocouple thermistors.

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, gauging techniques, applications. Variable inductance type transducers, 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, Electromagnetic clutches.

LIST OF EXPERIMENTS :-

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

REFERENCE BOOKS :-

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

SECOND YEAR B.TEXT. – SEMESTER - I

3.2 TEXTILE MATHEMATICS-III (TT/MMTT/TPE/TC)

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

1) Differential equations of first order & first degree :

Method of Solution :-

Variable, separable, homogeneous, non homogeneous, exact, non exact, linear and non linear differential equations.

2) Linear differential equations of n^{th} order with constant coefficients :-

Solution $y = C.F. + P.I$

Methods to find C.F. and P.I.

Homogeneous linear differential equations with constant coefficients.

3) Analytical solid geometry :-

Introduction to three dimensional co-ordinate system & sphere.

4) Surfaces & Curves in the Space :-

Tangent plane, Normal line to the surfaces in the space, Normal plane, Osculating plane, Principal normal & binormal.

5) Testing of hypothesis :-

Introduction, Hypothesis, Statistic, Critical Region, Errors in testing, Level of Significance.

6) Large sample tests :-

Test for population mean, equality of population means population proportion & equality of population proportions.

7) Small sample tests :-

Test for population mean, equality of population means, population variance, equality of population variance. Test for goodness of fit and independence of attributes. Test for significance of population correlation co-efficient.

8) Estimation :-

Point Estimation, types, unbiased estimators of population mean and variance.
Interval Estimation, Confidence Interval for population mean based on normal and 't' and χ^2 distributions,

9) Statistical quality Control :-

Process Control : Control charts, X-chart, R-chart, C-chart, np-chart, P-chart.

Lot Control : AQL, LTPD, AOQ, AOQL, O.C. Curve, Single and Double sampling plans.

REFERENCE BOOKS :-

1. A Text Book of Applied Mathematics : by J.N. & P.N. Watarikar.
2. Higher Engineering Mathematics by B.S. Grewal.
3. A Text Book on Engineering Mathematics by Bali, Saxena & Iyengar.
4. Mathematical Statistics by J.Fruend.
5. Applied Statistics & Probability of Engineers by Montgomeri & Runger
6. Probability & Statistics for Engineers by Johnson.

SECOND YEAR B.TEXT. – SEMESTER - I

3.3 POLYMER SCIENCE (MMTT/TC)

Lectures : 3 hrs/week.

Theory Paper : 100 marks.

Subject Total : 100 marks.

Chapter –I : Basic Determinants of Fibre Forming Polymers :-

Importance of polymer science. Various applications of polymers. Classification of polymers. Definition of monomer, oligomer, high polymer, mesomer, cohesive energy density, solubility parameter, glass transition temperature, functionality and degree of polymerization. Concept of basic determinants of fibre forming polymer. Effect of molecular weight, Symmetry, rigidity and chemical reactivity of polymeric chain on the properties of polymer. Concept of rubber, plastic and fibre. Essential requirements of suitability of a polymer for apparel wear and industrial applications.

Chapter –II : Condensation Polymerisation :-

Mechanism, types, features, essential requirements and importance of condensation polymerization. Carother's equation. Significance of Carother's equation. Concept of gelation & cyclic polymer formation. Effect of functionality on gelation. Factors affecting cyclization. Kinetics of condensation polymerisation. Stoichiometry of reactants and degree of polymerization.

Chapter-III : Addition polymerisation –

Mechanism, types, features and essential requirements of addition polymerization. Types of initiation, chemistry of initiators, retarders and inhibitors. Effect of catalyst, temperature, pressure, solvents, modifiers, emulsifying and suspending agents on addition polymerisation. Kinetics of addition polymerisation. Industrial applications of addition polymerisation.

Chapter-IV: Co-polymerisation :-

Concept of graft and block co-polymerization and their importance. Various techniques of grafting. Various factors such as temperature, time, dose-rate, concentration

of monomers, diffusion, scavengers, initiators & physical state on co-polymerization. Concept of ideal, alternating and azeotropic co-polymerisation. Reactivity ratios of monomers and its significance. Concept of Q-e scheme. Kinetics of co-polymerisation.

Chapter-V: Techniques of polymerization :-

Study of various techniques of polymerisation such as bulk, solution, suspension, emulsion, solid state, plasma polymerization.

Chapter-VI: Molecular Weight :-

Concept of \bar{M}_n , \bar{M}_w and poly-dispersibility & their significance. –Effects molecular weight distribution of polymer on spinnability & drawability. Light scattering and ultra centrifuge techniques to determine \bar{M}_w . Endgroup analysis, osmotic pressure, cryoscopic methods & viscosity methods to determine \bar{M}_n & \bar{M}_v . Characteristics of polymer using DSC, TGA, DTA, DMA and GPC.

Chapter-VII : Polymer Degradation –

Concept of chain end and random polymer degradation. Study of polymer degradation by thermal, mechanical, chemical and other agencies.

REFERENCE BOOKS :-

1. Polymer sciences and technology by Joel R. Fried.
2. Text book of polymer science by Fred W. Billmeyer, Jr.
3. Polymers and their properties by J.W.S. Hearle.
4. Organic chemistry of high polymers by Lenz.
5. Applied Polymer science by Flory.
6. Fundamentals of polymers by Anilkumar and Rakesh K. Gupta.
7. Principles of Polymerisation by George Odian.
8. Polymer science by Steven.
9. Introduction to polymer chemistry by G.S. Mishra.
10. Polymer science and technology of plastics & rubbers by Dr. Premamoy Ghosh.
11. Polymer Science by V.R. Gowarikar, N.V. Viswanathan & Jaydev Shreedhar.

SECOND YEAR B.TEXT. – SEMESTER - I

3.4 MANMADE FIBRE MANUFACTURE-I (MMTT)

Lectures	:	4 hrs/week
Practical	:	3 hrs/week
Theory Paper	:	100 marks
Term Work	:	25 marks.
Practical Exam.	:	50 marks.
Subject Total	:	175 marks

Structural Principles of Textile Fibres :-

Structural principles of fibre forming polymers : fibre forming processes, molecular size & interaction, molecular orientation and crystallinity in fibres, polymers as fibres, plastics and rubbers.

Physical Fundamentals of the Fibre Spinning Process :-

General principles of the spinning process, principles of solidification in spinning process, spinnability of liquids, Flow instabilities, Rheology of spinning, shear blow and elongation flow, formation of fibre structure : molecular orientation & crystallinity.

Principles of Melt Spinning :-

General features of the melt spinning process, Melt spinning variables and conditions for continuous spinning, Role of some critical parameters and their variation along spinning line. Structure formation during spinning, profile of polymer jet and velocity distribution. Effect of orientation and crystallinity on the behaviour of undrawn fibres, Non-steady state spinning conditions and non-uniform fibers. Melt spinning devices such as extruders, static mixer, pre-filtration, manifold, spinpack, cooling devices, T-up winders. Direct melt spinning, High speed spinning, Staple fibre production process, spin draw process, some special spinning methods.

Principles of Solution Spinning Process :-

Fundamental aspects of wet spinning process, post spinning operations, fibre formation and coagulation variables.

Fundamental aspects of dry spinning process, preparation of spinning solution, extrusion, spinning, theory of filament formation, stretching , dry-jet wet spinning process.

Drawing of Melt Spun Fibres :-

Drawing unit, drawing behaviour of thermoplastic fibres, Influence of drawing on structure and properties of filament yarns, orientation stretching for high strength, draw warping.

Heat Setting of Thermoplastic Fibres :- Nature of set, Heat setting behaviour of polyamides and polyester fibres, Heat setting of cellulosic triacetate fibres, settability and measurement of degree of set.

LIST OF EXPERIMENTS :-

1. Demonstration of laboratory melt spinning unit and production of filament yarn.
2. Demonstration of laboratory filament yarn drawing machine and drawing & heat setting of polyester POY.
3. Measurement of MFI of given polymer using KAYJAY MFI testing apparatus.
4. Study the effect of temperature and thermal treatment on MFI of polyolefins.
5. Study the effect of melt spinning extrusion temperatures on characteristics of filament yarn.
6. Study the effect of spinning speed on the characteristics of filament yarn.
7. Study the effect of cold drawing and hot drawing on filament yarn properties.
8. Comparison of properties of single and two stage drawn polyesters filament yarns.
9. Study the effect of draw ratio and drawing temperature on properties of filament yarns.
10. Maintenance of spin pack.
11. Industrial visit.
12. Industrial visit

REFERENCE BOOKS :-

1. Fundamentals of fibre formation – Andrej Ziabicki
2. High speed spinning - Ziabicki and Kawai
3. Man Made fibre science and technology - Marks and Allas.
4. Manufactured fibre technology - V.B. Gupta, and V.K. Kothari.
5. Production of synthetic fibres – A.A. Vaidya.
6. Book of papers of NCUTE Programmes on Man Made fibres.
7. Setting of fibres and fabrics – Hearle J.W.S. & Miles L.W.C.

SECOND YEAR B.TEXT. – SEMESTER - I

3.5 MANMADE STAPLE YARN MANUFACTURE-I (MMTT)

Lectures	:	4 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Term Work	:	25 marks.
Subject Total	:	125 marks

1. BLOW ROOM :

- a) Automatic Bale Openers – Concept of automatic bale opening – Principle of operation – advantages limitations and prerequisites – Developments in automatic bale openers. Detailed study of automatic bale openers used in the industry (LMW, Trumac, Rieter, Marzoli and others). General construction, driving arrangements, dimensions and specifications, types of bale lay down, settings and timings, power requirements, stop motions, safety arrangements, productions.
- b) Mild Openers – Concept and importance of mild opening – General design aspects of a mild opener – History and developments - Detailed Study of present day mild openers from various manufactures (LMW, TRUMAC, RIETER, MARZOLI & Others) – General construction, driving arrangement, dimensions and specifications, setting and timings, power requirements, stop motions, safety arrangements, production, online monitoring.
- c) Blenders – Importance of blending – Methods used for Blending of cotton in Blow room – History and Development of Mechanical Blenders – Detailed Study of present day blenders used in the industry - General construction, driving arrangement, dimensions and specifications, setting and timings, power requirements, stop motions, safety arrangements, production, online monitoring.
- d) Fine Openers – Concept and principle of operation, design features – History and Developments – Detailed Study of present day fine openers used in the industry (LMW, TRUMAC, RIETER, MARZOLI & Others) - General construction, driving arrangement, dimensions and specifications, setting and timings, power requirements, stop motions, safety arrangements, production, online monitoring.

- e) Material Transportation – Concept and Principle – Detailed Study of material transportation equipments used in Blow room.
- f) Safety control used in Blow room – Metal detectors – Heavy parts separator, smoke detectors.
- g) Study of Auxiliary equipments in Blow room – dedusters, contamination removers.
- h) Study of on line monitoring and controlling system used in blow room.
- i) Assessment of Performance of a Blow room – Intensity of opening, openness value, cleaning efficiency. Influence of action of blow room machine on cotton fibre quality – Factors affecting opening and cleaning at Blow room.

2. CARDING :

- a) Feed to Card – Principle and concept of chute feed to card. Advantages and limitations. Study of design details of different types of chute feeding systems available in the market.
- b) Revolving Flat Card – Detailed study of design developments in Take up zone, Cylinder Flat Carding Zone – Doffer Zone – Sliver formation – Study of cards used in the industry – General construction – Driving arrangement, production calculations, draft calculations, stop motions – on line monitoring – Tandom Cards.
- c) Carding Theory – Opening of fibre mass – Carding actions – Web formation and fibre configuration – Blending – Levelling action – Fibre breakage.
- d) Transfer efficiency of card – importance, concept, methods of finding transfer efficiency.
- e) Autolevellers at Card – Basic principles and concept – Types of autolevellers – Principle of working of autolevellers at Card – Setting of autolevellers.
- f) Card Clothing – History and Development – Metallic wire – Tooth geometry – Maintenance of Card Clothing – Card wire mounting.
- g) Assessment of performance of card – Cleaning efficiency, Nep removal efficiency, fibre breakage.
- h) Centralised Waste collection System :Design features, operating principles.

3. DRAWFRAME :-

- a) Functions of drawframe, principles of drafting and doubling. Study of constructional details and design considerations of a drawframe. Calculations relating to speeds, drafts, production etc.
- b) Principles of roller drafting, design details of drafting system, evolution of drafting systems at drawframe (Shirley 4/4 draftings, plats, pressure bar, whitin accu drafting. Rieter polar drafting systems etc. Developments in drawframe drafting.
- c) Suction at drawframe. Automatic can handling. Auto leveling at drawframe. On-line quality monitoring and control.
- d) Study of drawframes available in the market. Blending at drawframe.
- e) Study of maintenance aspects and design developments such as rollers, roller, roller weightings, drafting systems etc.
- f) Assessment of performance of drawframe. Defective production at drawframe, Causes and remedies for the same. Norms for production, sliver quality, waste etc.

LIST OF EXPERIMENTS :-

1. Study of Bale Opening machine - Dimensions, Driving arrangement and calculation
2. Study of Mild Opener and Coarse Cleaning m/cs - Dimension, Driving arrangement, calculation.
3. Study of Blending machine. Dimension, driving arrangement, calculation.
4. Evaluation of blow Room performance
5. Study of chute feed system.
6. Study of constructional details of a card.
7. Driving arrangement and calculations of carding machine.
8. Settings of feed zone, carding zone and delivery zone of carding machine.
9. Evaluating of carding performance.
10. Study of constructional details of draw frame.

11. Driving arrangement and calculation of D/F.
12. Evaluation of Draw frame performance.

REFERENCE BOOKS :-

- 1) The Technology of Short Staple Spinning by W. Klein, The Textile Institute Publications – Short Staple Spinning Vol.1.
- 2) A Practical Guide to Opening and Carding by W. Klein, The Textile Institute Publications – Short Staple Spinning Vol.2.
- 3) Opening, Cleaning and Picking by Dr. Zoltan S. Szaloki, Institute of Textile Technology, Virginia.
- 4) Drawing Combing and Roving by Dr. Zoltan S. Szaloki, Institute of Textile Technology, Virginia.
- 5) Drawframe, Combing & Speedframe by J.H. Black, The Textile Institute Publication, Manual of Cotton Spinning Vol.-IV Part-II.
- 6) Cotton Carding by G.R. Merril.
- 7) Cotton Drawing & Roving by G.R. Merril.
- 8) Textile Mathematics Vol.-I & Vol.-II by J.E. Booth.
- 9) NCUTE Training Programme Publications on Blowroom, Carding & Drawframe.
- 10) Trade Literature / Bulletins / Pamphlets of Trutzschler, Rieter, LMW, Cross-roll, Marzoli etc.
- 11) Essential Calculations of Practical Cotton Spinning by T.K. Pattarbhram.

SECOND YEAR B.TEXT. – SEMESTER - I

3.6 MANMADE FABRIC MANUFACTURE-I (MMTT)

Lectures	:	4 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Term Work	:	25 marks.
Subject Total	:	125 marks

1) AUTOMATIC WEAVING :-

- a) Limitations of ordinary looms :- Production, efficiency, quality & allocation, objectives for developing automatic looms, scope for automation.
- b) Design features of automatic looms :- Drives, loom motions, accessories & other critical features of automatic looms.
- c) Weft feelers :- Construction working of side sweep (Cimmco & Ruti-B Type), electrical (Ruti-C Type) & electronic weft feelers, their merits & demerits & applications.
- d) Transfer mechanism :- Cimmco & Ruti-C transfer motions working & construction, shuttle protector, temple & shuttle eye cutter. Requirement for successful transfer of pirn, reasons of stripping, bottoms & remedies. Shuttle changing mechanism & safety motion, its applications.
- e) Automatic let-off motion :- Principles and requirements of automatic let-off mechanism, types, construction & working of Cimmco, Ruti-B, Ruti-C type let-off motions.
- f) Warp stop motion :- Types, Construction and working of mechanical and electrical warp stop motion, Types of drop pins, specifications & applications.
- g) Centre weft fork :- Construction & working of Ruti-C type center weft fork motion & its advantages.
- h) Operator assisting motions :- Pick finding, heald leveling, light indicators, pick counters need, functions & use.
- i) Auto loom fabric defects, causes and remedies

2) **FABRIC STRUCTURE :-**

Study of presentation of following weaves on graph (Design, draft & peg plan) & Study of weave characteristics & weaving requirements.

- i) Backed fabrics – Warp, weft and wadding backed fabrics.
- ii) Bed ford words – Plain, twill, wadded crepon cords,
- iii) Pique :- Plain, wadded & waved pique.
- iv) Figuring with extra threads :- Principles, extra warp, extra weft figuring, combination, limitation, extra thread effect.
- v) Gauze & Leno :- Principles, basic sheds, Leno with flat steel doups & slotted doups, point draft or counter leno, simultaneous top & bottom douping, application of slotted doups & double slotted oups, rasing & shaker motion concept & working & construction.
- vi) Double cloth :- Object, classification, self stitched doubled cloth, center stitched double cloths, luterchanging double cloth, multiplayer fabrics.
Selection of face & back weavers, type of stitching points & their selection, wadded double cloth.
- vii) Warp pile – wire method, face to face weaving & terry pile. Weft pile – velveteens & velours
- viii) Fabric Engineering :-
Peirce's yarn diamentter formula & its limitations. Fabric cover & crimp factors.
Cloth geometric of plain, twill weave. Practical application of cloth geometry & cover factor.
- ix) Construction & Development of Jacquard Designs :-
Elements of Jacquards shedding – Double lift, Jacquard with single & double cylinder working Jacquard sizes, Harness tier, Harness drawing – in, card cutting & card lacking. Harness & design calculation – Setting of harness, number of harness cords to each hook, casting out, size of repeat, count of design paper.
Development of Jacquard Designs – Construction of squared paper designs, Process of drafting a sketch design, drafting designs from woven fabrics.

3) AUTOMATIC WINDING :-

- a) Classification of automatic winding machine P & Q winding, their application.
- b) Construction of automatic winding machines
 - 1) Design features, i.e. yarn path (Creel, link presenter, booster, unwinding accelerator, pre cleaner, tensioners, waxing, cradle etc.)
 - 2) Drive to drums, scroll details, super drums, braking etc.(Autoconer – 238,338,338 D, Savio Espero & Orion, Murata – 11C, 7-V).
 - 3) Special features of all models, blowers, air consumption & power.
- c) Yarn Clearing :-
 - 1) Technical background
 - 2) Optimum clearing.
 - 3) Uster classimat as an aid for yarn clearing.
- d) Electronic yarn clearers
 - 1) Optical & capacitance, Loefc, TK 930F, TK 950H, Quantum-II etc.
 - 2) The capabilities of different yarn clearers.
 - 3) Detailed method of setting of optical & capacitance type clearer (for carded & combed yarns)w.r.t. N,DS, DL,LL,-D,-L,C, Cluster setting, splicer setting, extended splicer setting for various yarn counts and materials.
 - 4) Siro cuts.
 - 5) Knot factor & clearing efficiency & its use as an aid to assess the performance of winding machines.
- e) Splicing :-
 - 1) Types – mechanical & pneumatic, details of construction, parameters, their applications .
 - 2) Electronic checking of sliced joint.
 - 3) Slice quality assessment (strength, appearance, hairness)
 - 4) Maintenance of splicers.
- f) Study of various & delivery packages.

4) MODERN WARPING :-

- a) Constructional details & features of modern warping machines. Such as Benninger, West Point, Sucker-Mullar, Tsdakoma & Karl with reference to

- design of creel, pre-tensioners, automatic adjustment of central control of tensioners.
- b) Types of re creeling – magaine / truck / chain creels / semi – auto & auto creels, creel – master, auto plan for colour patterns.
 - c) Head Stock - Beam warping – Auto leasing, drive, brakes and automation doffing & donning.
 - d) Sectional warping – Auto leasing drum traverse & cone angle adjustment, beam traverse & its adjustment.
 - e) Machine systems & its use.

LIST OF EXPERIMENTS :-

- 1) Dismantling & resetting of under pick mechanism.
- 2) Dismantling & resetting of Cimmco & Ruti-C loom weft feeler motion.
- 3) Dismantling & resetting of Cimmco auto loom let-off motion.
- 4) Dismantling & resetting of pirn change motion.
- 5) Study of Ruti-C loom-drive, centre weft fork, pick finding, take-up drive, back rest, multipawl drive, shuttle construction, picking, loose reed motion etc.
- 6) Study of sectional warping drive – warping speed, beaming speed, reed & beam traverse speed, production and efficiency.
- 7) Study of Laxmi & Senmet pirn winding machine – spindle speed, traverse speed, coils per double traverse, diameter control, production & efficiency.
- 8) Dismantling & resetting of warp stop motion.
- 9) Fabric analysis – Extra warp, Extra weft, Bedford cord, pique, leno, double cloth, pile fabric.
- 10) Fabric analysis – Extra warp, Extra weft, Bedford cord, pique, leno, double cloth, pile fabric.
- 11) Fabric analysis – Extra warp, Extra weft, Bedford cord, pique, leno, double cloth, pile fabric.
- 12) Visit to Autoconer unit.
- 13) Visit to Autoloom unit.

REFERENCE BOOKS :-

- 1) Principles of Weaving by Marks A.T.C. & Robinson.
- 2) Textile Colour & Design by Watson.
- 3) Weaving Machines, Materials & Methods by Prof. M.K. Talukdar, Prof.D.B. Ajgaonkar etc.
- 4) Textile Mathematics – Vol.-I & II by J.E. Booth.
- 5) Advanced Textile Design by Watson
- 6) Modern Preparation & Weaving Machines by A. Ormerod.

S.Y.B.TEXT. (MMTT) SEMESTER-II

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB. TOTAL
4.1	TT/MMTT/TPE/TC	THERMAL AND AIR ENGINEERING	3	---	---	---	100	---	---	---	100
4.2	TT/MMTT/TPE/TC	TEXTILE MATHEMATICS-IV	3	---	---	---	100	---	---	---	100
4.3	MMTT	MANMADE FIBRE MANUFACTURE-II	3	---	---	2	100	25	---	50	175
4.4	TT/MMTT	CHEMICAL PROCESSING OF TEXTILES-I	3	---	---	2	100	25	---	---	125
4.5	MMTT	MANMADE STAPLE YARN MANUFACTURE-II	4	---	---	2	100	25	---	50	175
4.6	MMTT	MANMADE FABRIC MANUFACTURE-II	4	---	---	2	100	25	---	50	175
4.7	TT/MMTT	TEXTILE DESIGN & COLOUR	---	---	2	---	---	50	---	---	50
			20	---	2	8	600	150	---	150	900

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SECOND YEAR B.TEXT. – SEMESTER - II

4.1 THERMAL & AIR ENGINEERING (TT/MMTT/TPE/TC)

Lectures	:	3 hrs/week
Theory Paper	:	100 marks
Subject Total	:	100 marks

1. Introduction – Laws of Thermodynamics – Zeroth Law, First Law, Second law of Thermodynamics. Thermodynamic Process – constant volume, constant pressure, constant temperature, adiabatic, polytropic & throttling process with P-V & T- ϕ diagrams and numericals..

2. Air Standard Cycle – Introduction, Assumptions in thermodynamic cycles, Important terms used in thermodynamic cycles, efficiency of a cycle, Carnot cycle, Otto cycle, Diesel cycle, Dual combustion cycle on P-V and T- ϕ diagram and numericals.

3. Properties of Steam – Formation of steam at constant pressure – Enthalpy, Enthalpy of water, Enthalpy of evaporation, Enthalpy of dry saturated steam, Wet steam, Superheated steam, Specific volume of steam, Steam table, External work done during evaporation, Internal energy of steam, difference between Gas & Vapour. Measurement of dryness fraction – Throttling calorimeter, separating calorimeter, combined separating & throttling calorimeter, Use of steam in textiles – Sizing, Wet processing and numericals based on properties of steam & calorimeters.

4. Steam Boilers – Introduction, Classification of boilers, Study & construction of fire tube boilers such as Cochran boiler, Study & construction of water tube boiler such as Babcock & Wilcox boiler, equivalent evaporation, efficiency of boiler & numericals.

5. Study of boiler mountings & accessories – Safety valve – Dead weight safety valve, Lever safety valve, Spring loaded safety valve, Combined high pressure steam & low water safety valves, Water level indicator, Fusible plug, Steam pressure gauge, Feed check valve, Stop valve, Blow off cock, Accessories – Feed water pump, Injector, Economizer, Superheater.

6. Thermic Fluid Heating System – Introduction, Thermic heating system, Expansion & Deviation, Selection of Tanks, Requirements of Fluids, Deterioration of fluid, Consequences, Cleaning of the system.

7. Refrigeration – Units of refrigeration, C.O.P., Difference between heat engine, Refrigerator, heat pump. Air refrigerator working on reversed Carnot cycle on P-V & T- ϕ diagram, expression for C.O.P.

8. Air Conditioning – Introduction to air conditioning, psychrometric terms, Dalton's law of partial pressure, Psychrometric relations, Enthalpy of moist air, Thermodynamic wet bulb temperature, Psychrometric chart, Psychrometric processes, - Sensible heating & cooling, bypass factor of heating & cooling coil, Humidification & dehumidification, methods of humidification in textile industry, methods of dehumidification, sensible heat factor, cooling & dehumidification, cooling with adiabatic humidification by steam injection, Adiabatic chemical dehumidification, Adiabatic mixing of two air streams, Object of a/c & proper humidification in textile mills, Effect of moisture on textile fibres, Sling psychrometer, Humidistat.

9. Compressor – Classification, Reciprocating, Rotary vane compressor, Liquid ring compressor, Twin lobe compressor, Screw compressor, Centrifugal compressor, Axial flow compressor. Pumps – Reciprocating, Centrifugal & Radial (working and principle only).

10. Pneumatics –

(a) Pneumatic Circuits – Symbols of cylinder, control valves, check valves.

(b) Air treatment – Air filter and its symbol, Refrigerated dryer, Lubricators.

(c) Control valves – Poppet valve, Pilot operated check valve and spool valve. Symbol of every valve,

(d) Loop system in piping lay out, Pressure drop in pneumatic line.

(e) Examples of pneumatic circuits.

REFERENCE BOOKS :-

1. Elements of Heat Engines (Vol. I & II) by Patel, Karamchandani.
2. Refrigeration & Air conditioning by Arora & Domkundwar
3. Pneumatic Systems by Majumdar
4. Hydraulics & Pneumatics by Andrew & Parr
5. Hydraulic machines by Banga, Sharma.
6. Heat Transfer by S.P. Sukhatame.

SECOND YEAR B.TEXT. – SEMESTER - II

4.2 TEXTILE MATHEMATICS-IV (TT/MMTT/TPE/TC)

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

1. Laplace Transforms :-

Definition, transforms of standard functions, transforms of derivatives, integrals and periodic functions. Inverse Laplace transforms by partial fraction and convolution method.

2. Vector differentiation :-

Differentiation of vector valued function of scalar 't', gradient, divergence, curl, directional derivative. Solenoidal and irrotational vector fields.

3. Vector Integration :

Line, surface & volume integrals, Stoke's and Green's and Guass divergence theorem (without proof) and examples.

4. Projectiles :-

Motion of a body thrown horizontally in the air. Motion of a projectile, equation of path of projectile, Time of flight of a projectile on a horizontal plane, Horizontal range of a projectile velocity and direction of motion of projectile, Time of flight of a projectile on a inclined plane.

5. Analysis of Multivariate Data :-

Multiple and Partial correlation coefficients. Plane of regressions.

6. Analysis of Variances :-

Introduction, One-way Classification, Two-way Classification with and without repetition.

7. Design of Experiments :-

Introduction, Basic principles, Basic Designs (CRD, RBD & LSD).

8. Factorial Experiments :-

Introduction & types, 2^n factorial experiments, 2^2 & 2^3 factorial experiments.

REFERENCE BOOKS :-

1. A Text Book of Applied Mathematics : by J.N. & P.N. Wattikar.
2. Higher Engineering Mathematics : by B.S. Grewal.
3. A Text Book on Engineering Mathematics :by Bali, Saxena & Iyengar.
4. Mathematical Statistics : by J.Fruend.
5. Applied Statistics & Probability of Engineers : by Montgomeri & Runger
6. Probability & Statistics for Engineers : by Johnson.
7. Design and Analysis of Experiments : by Montgomeri.
8. A Text Book of Engineering Mechanics : by R.S. Kurmi.

SECOND YEAR B.TEXT. – SEMESTER - II

4.4 CHEMICAL PROCESSING OF TEXTILES – I (TT/MMTT)

Lectures	:	3 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Term work	:	25 marks
Subject Total	:	125 marks

SIZING :-

- a) Introduction to sizing, object of sizing, different sizes for different fibres, size paste ingredients.
- b) Adhesive & their classification, study of Maize, Potato, TKP, CMC, PVA and thin boiling starches. Physical & chemical properties. Testing of adhesives like Identification of material, viscosity, keeping property, congelling.
- c) Function of softners and lubricants. Study of softners like mineral oil and plastisizers, vegetable tallow, mutton tallow, synthetic tallow. Testing of softners.
- d) Functions of antiseptics and weighting agents. Some inorganic and organic antiseptics used for sizing. Testing of weighting agent.
- e) Size recipe formulations for cotton, viscose, polyester & poly / cellulose blends. Testing of sized yarn & identification of sizes. Optimisation of size recipe.
- f) Introduction of pretreatments in wet processing. Importance of grey inspection. Introduction to shearing & cropping machines.
- g) Object of singeing. Gas singeing for woven and knitted fabrics. Introduction of indirect singeing methods.
- h) Object of desizing, Hydrolytic and oxidative methods of desizing.
- i) Object of scouring, scouring with alkali and solvents. Study of batch and continuous machines for scouring. Bleaching with hypo-chlorites, hydrogen peroxide and peractic acid for cotton, polyester an their blends.

Batches. Batchwise and continuous machines for bleaching. Bleaching of wool, silk nylon and acrylic.

- j) Object of mercerization, study of mercerization on structure of cellulose. Mercerization & machines used for yarn, woven and knit fabrics. Study to hot mercerization, liquid ammonia mercerization. Testing methods of evaluate the efficiency of mercerization. Production of mc/s.

LIST OF EXPERIMENTS :-

- 1) Identification by microscope.
- 2) Testing and analysis of adhesive.
- 3) Testing and analysis of softner purity.
- 4) Estimation of size % in gray fabric.
- 5) Desizing of cotton & Poly / cotton blend by different methods.
- 6) Scouring of cotton polyester and their blends.
- 7) Bleaching of woven and knitted fabrics.
- 8) Determination of mercerization efficiency by BAN method.
- 9) Degumming of silk.
- 10) Scouring and bleaching of wool.
- 11) Determination of whiteness, yellowness of bleached fabric by CCM.
- 12) Formulation of size recipee & testing the performance using single end sizing machines.
- 13) Study of adhesivity on fibres of different formulations.

REFERENCE BOOKS :-

1. Sizing by Prof.D.B. Ajgaonkar, M.K. Talukdar & V.R. Wadekar.
2. Chemical technology of fibrous materials by F. Sadov.
3. Chemical Processing of Polyester/Cellulosic blends by R.M.Mittal & S.S. Trivedi.
4. Chemical processing of synthetic & blends by K.V. Datye & A.A. Vaidya.
5. Mercerizing by J.T. Marsh.
6. Introduction to Textile bleaching by J.T. Marsh.
7. Bleaching, Dyeing & Chemical Technology of textile fibres by S.R. Trotman.
8. Technology of Bleaching by V.A. Shenai.

9. Warp Sizing by Paul V. Seydel.
10. Warping and Sizing by BTRA Silver Jubilee Monograph series.
11. Bleaching & Mercerizing by BTRA Silver Jubilee Monograph series.

SECOND YEAR B.TEXT. – SEMESTER - II

4.7 TEXTILE DESIGN AND COLOUR (TT/MMTT)

Draw. Practical:	2 hrs/week
Term work :	50 marks
Subject Total :	50 marks

LIST OF EXPERIMENTS :-

1. Units developments for textile design.
2. Colour modification chart.
3. Colour theory chart.
4. Textile design development with the help of designing principles.
5. Composition of all over textile design by following bases – (Any two assignments)
 - a. Sq. or Rectangle base
 - b. Drop base – half drop, full drop, 1/3 or 2/3 drop
 - c. Diamond base.
 - d. Ogce bse
 - e. Satin base.
6. Development of point paper design for dobby weaving (Any two).
 - a. Extra warp
 - b. Extra weft
 - c. Backed cloth
 - d. Double cloth
7. Development of point paper design for jacquard.
8. Basics of computer aided designing software for dobby.
9. Use of dobby software for designing.
10. Designing different colour patterns, motifs for dobby weaving.
11. Basics of computer aided designing software for jacquard.
12. Use of jacquard software for designing.
13. Designing different motifs, colour pattern for jacquard weaving.

SECOND YEAR B.TEXT. – SEMESTER - II

4.3 MANMADE FIBRE MANUFACTURE-II (MMTT)

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

Polyester Fibre :-

Ploy (ethylene terephthalate fibre) – Overview of the processes to produce polyester staple / filament yarns. Polymer production, fibre production, structure and properties of polyester fibre. Developments in polyester fibres, polyester fibres other than PET, polyester micro filament yarns, their production, properties and applications.

Polyamide Fibres :-

Nylon 6, nylon 6,6 polymer production, production of nylon 6, & 6,6 fibres, structure and properties of nylon 6 and nylon 6,6 fibres. Developments in nylon fibres, Studies of other nylon fibres.

Polypropylene Fibres :-

Tacticity of polypropylene, production of polypropylene polymer, production of polypropylene fibres, Effect of pigments on fibre characteristics, problems in the fibre production and possible causes, structure and properties of polypropylene fibres, application areas.

Acrylic Fibre :-

Production of PAN polymer for acrylic and modacrylic fibres. Spinning of PAN fibres, structure and properties of PAN fibres, application areas, Developments in acrylic fibres.

Viscose Fibres :-

Production of viscose fibres – preparation of spinning solution, spinning of fibres, HWM & LWM fibres, structure and properties of viscose fibres, Developments in viscose fibres.

Tencel Fibres:-

Production of Tencel fibre, properties and application of Tencel fibre.

Acetate Fibres:-

Production, properties and application of acetate and triacetate fibres.

Regenerated Protein fibres :-

Principle of manufacture, casein fibre, vicara fibre, Aradil fibres, General properties of these fibres, application areas.

Tape yarns :-

Production, Properties and application areas.

Elastomeric Fibres:-

Extensibility and recovery mechanism, fibre production. Properties of elastomeric fibres and application areas.

LIST OF EXPERIMENTS :-

1. Demonstration of high speed draw winder and production of FDY .
2. Production of intermingled yarns using draw winder.
3. To determine the density of fibre by using Density Gradient Column.
4. To determine the spin finish of the given sample by cold extraction method.
5. To determine the draw force, and shrinkage force of POY using Dynafil Tester.
6. To determine the crimp contraction force, and shrinkage force of textured yarns using Dynafil tester.
7. To determine the crimp rigidity of textured yarn.

8. To determine the boiling water shrinkage and hot air shrinkage of the given filament yarns.
9. Study the effect of heat-setting temperature on the dimensional stability of filament yarns.
10. Study the effect of heat setting time on the dimensional stability of filament yarns.
11. Industrial Visit.
12. Industrial Visit

LIST OF REFERENCES :-

1. Manufactured fibre technology – V.B. Gupta and V.K. Kothari.
2. Synthetic fibre production – A.A. Vaidya.
3. Fibre science and technology – S.P. Mishra.
4. Book of papers of NCUTE training programmes on man made fibres.
5. Man-Made fibres – Moncriff.
6. Hand book of fibres – Gorden & Cook.
7. Production and application of poly propylene fibres – O. pagjart B. Reichstadts
8. Textile Fibres – V.A. Shenai.

SECOND YEAR B.TEXT. – SEMESTER - II

4.5 MANMADE STAPLE YARN MANUFACTURE-II (MMTT)

Lectures	:	4 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Term Work	:	25 marks.
Practical Exam.	:	50 marks
Subject Total	:	175 marks

1. COMBER :-

COMBER PREPARATORY :

- A. Requirements of good lap – importance of number of passages, importance of good lap, linear density of lap, etc.
- B. Methods of comber lap preparation – Different sequences of comber lap preparation, study of sliver lap machine, ribbon lap machine, unilap machine. Developments in combing preparatory machines.
- C. Maintenance & Assessment of combing preparatory machines.

COMBING :

- a. Objects of combing process. Study of combing cycle.
- b. Constructional details of Comber- feeding, nipper assembly, cylinder and detaching rollers, cylinder needles, web and sliver transport, drafting and coiling at comber.
- c. Semi combing, normal combing, super combing and double combing. Forward and backward combing.
- d. Maintenance of comber. Index Cycle, Comber Settings.
- e. Assessment of performance of comber – Norms for production, speed. Combing efficiency, Fractionating efficiency of comber. Influence of combing operation on quality.
- f. Automatic and centralized noil extraction. Automatic material handling. Stop motions in comber.
- g. Technical specifications of modern combers available in the world market.

3. SPEEDFRAME :-

- A. Objects of speed frame. Concept of drafting, twisting and winding process.
- B. Constructional aspects of Speedframe – Creel, Top arm apron drafting system, Spindle & Flyer assembly, Bobbin building at speed frame, stop motions.
- C. Study of mechanisms like – differential motion, swing motion, building mechanism, semi-automatic and automatic doffing, etc.
- D. Assessment of performance of Speedframe - Productivity and Quality norms of speed frame, Zero break concept, block creeling.
- E. Maintenance of speed frame.
- F. Features of modern speed-frame machines available in the market.
Developments in speed frame drafting. Developments in flyer design. Stop motions. Semi Automatic and automatic doffing. Materials handling. Transport of bobbins to ring spinning machines. Technical specifications of modern speed frames available in the world market.

4. RINGFRAME :-

- A. Objects of ringframe. Concept of twisting & winding process.
- B. Constructional aspects of ring frame – Creel, Drafting arrangements, spindle, yarn guiding devices, Balloon control rings, Ring & travellers.
- C. Study of Building motion, type of builds.
- D. Study of spinning geometry of various ringframes.
- E. Assessment of performance of ring frame – productivity and quality norms of ring frames.
- F. Maintenance of ring frame.
- G. Features of modern ring frames available in the market.

LIST OF EXPERIMENTS :-

1. Study of Passage of material and gearing Calculation of Modern combing preparatory m/c – I
2. Study of Passage of material and gearing Calculation of Modern combing preparatory m/c – II

3. Study of constructional details of a modern comber,
4. Study of gearing, calculation and index cycle of a modern Comber.
5. Study of Comber Setting.
6. Study of constructional details and gearing of a modern speed frame.
7. Study of modern ring frame, gearing and calculation.
8. Study of speed frame setting – lift setting, building – mechanism, & change place.
9. Ring frame setting – ring rail leveling, Spindle gauging, lappet rail ,etc
10. Study of building Mechanism of Ring frame.
11. Visit to Modern spinning Mill.

REFERENCE BOOKS :-

- 1) Drawing, Combing & Roving by Zoltan S. Szaloky, The Institute of Textile Technology, Virginia.
- 2) Drawframe, Combing & Speedframe by J.H. Black, The Textile Institute Publication, Manual of Cotton Spinning Vol.-IV Part-II.
- 3) Cotton Drawing & Roving by G.R. Merrill.
- 4) Textile Mathematics Vol.-I & Vol.-II by J.E. Booth.
- 5) NCUTE Training Programme Publication on Combing & Ringframe.
- 6) Trade Literature / Bulletins / Pamphlets of Trutzschler, Rieter, LMW , Cross – roll Marzoli etc.
- 7) A Practical guide to Combing & Drawing Vol.-III by W.Klein, The Textile Institute, Manual of Textile Technology, Short Staple Spinning Series.
- 8) A Practical guide to Ring Spinning by Vol.-IV by W.Klein, The Textile Institute, Manual of Textile Technology – Short Staple Spinning Series.
- 9) Textile Progress Vol.-III No.2, - A Critical Appreciation of Recent Developments – Yarn Production & Properties – W. Nuttler.

SECOND YEAR B.TEXT. – SEMESTER - II

4.6 MANMADE FABRIC MANUFACTURE-II (MMTT)

Lectures	:	4 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Term Work	:	25 marks.
Practical Exam.	:	50 marks.
Subject Total	:	175 marks

1) **SIZING :-**

- Study of modern sizing machine element.
- 1) Creel – construction, braking arrangement & positive drive.
 - 2) Size Box – various size boxes, 1 nip 1 dip, 2 nip 2 dip, dressing rollers, Zell, Sucker, West point, Benninger, Tsudakoma size box constructions Various roller constructional details.
 - 3) Drying Cylinders – Heating arrangement, coating ,temperature & its control, pressure of steam, thermal performance of drying cylinders, steam traps & its types & importance.
 - 4) Head Stock – Dry splitting, measuring motion , drag roller, comb & drive to weavers beam, pressuring device.
 - 5) Control Systems- Importance, consequences of moisture, temperature, size level, on line size percentage, Stretch control systems.
 - 6) Factors affecting size pick up & size add-on, migration.
 - 7) Assessment of sizing performance – laboratory & practical methods.
 - 8) Concept of single end sizing & various methods.
 - 9) Concept of dyeing cum sizing.
 - 10) Automation and MIS on modern machines.
 - 11) Concept of recycling of sizes.
 - 12) Calculations – Related to size concentration, size pick up, stretch, drying, count of warp production etc.

2) **SHUTTLELESS WEAVING :-**

- a) Limitations of shuttle loom with respect to weaving process, engineering aspects & environmental aspects.
- b) Classification of shuttleless weaving machines.
- c) Projectile weaving machine – History of shuttleless weaving machine ; Projectile machine models TW11 To P71300 ; Machine drive, various motions timing, shedding Cam motion, Beat-up motion, limitations of shuttle loom picking motion; Projectile picking concept, picking motion, picking phases, Projectile acceleration & retardation, torsion rod details, Projectile preparation for picking, selvedge motion, Receiving unit Selvedge weaves, Let-off motion (Mechanical & power), Take-up motion, their advantages in relation to shuttle loom motions, specifications of projectiles & grippers for various applications, Machine speed timings, power specifications for various widths, all auxiliary motions such as brake, clutch, oiling cleaning MIS, general electronic circuit, pick finding, multi colour weft insertion, weft stop, warp stop whip roller, weft brake etc. Fabric defects & remedies.
- d) Rapier Weaving Machine -
Various rapier weaving machines such as Picanol, Smit, Somet, Vamatex, Dornier, Sulzer, Panther etc. Various machine models available of above make & their brief history.
Study of weft velocity curves for looms with different methods of weft insertion. Concept of Dewas & Gabler rapier systems, their comparison with other weft insertion systems from weft acceleration & retardation point. Study of effect of reed width on loom speed.
Principles of different single & double rapier weft insertion systems (Drive), their comparison. Study of rapier heads.
Smit rapier machine models, machine drive, Timings of various motions, cam shedding & beat up motion, Rapier motion drive details, Details of rapier tape, head, sely construction, guiding elements, Gripper openers, cutters, stroke adjustment. Selvedge forming elements & adjustments.

Let-off & take up motion (Mechanical & power), their adjustments for various pick density range, specifications of rapier & head for various applications. Specifications speed, power & machine timing for various widths.

All auxiliary motions such as brake, clutch oiling, cleaning, MIS, General electronic circuit, pick finding, multi colour weft insertion, weft-stop, warp stop, whip roller, weft brake etc.

Fabric defects & remedies, weft waste during selvedge formation.

Detailed study of Dornier rapier weaving machine on above line.

3) HIGH SPEED SHEDDING MECHANISMS :-

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

Limitation of lever & cam negative dobbie, positive lever dobbie, positive rotary cam concept, Rotary mechanical & electronic control dobbie, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.

Limitation of mechanical Jacquard, concept of electronic Jacquard, constructional & working details 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 & management, Networking with looms.

4) WEFT KNITTING

1. Basic structure of warp & weft knitted fabric. Comparison with woven fabric with respect to production and properties.
2. Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as :
 - a) Creel – Construction, types, capacity and their suitabilities.
 - b) Yarn feeding – Need, construction, drive, types of positive and negative feeders, stop motions, indicators, tensioners etc.

- c) 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.
- d) Take down motion – Spreader, Nip roller, cloth roller, Drive mechanism and its types, capacity. Machine and material monitoring systems.
- 3. Study of weft knitted structures :-
Principle stitches such as knit, tuck, miss and their representation. Types of knitted fabrics such as single jersey, double jersey and their derivatives like interlock, Rib and purl etc. and manufacturing process of above fabrics. Conditions for the use of delayed & synchronized timing. Pattern analysis method, Needle order, Cam order. Pattern structures with one, two, three & four needle types. Concept of colour Jacquards structures.
- 4. Relative Technology (Relanit) on circular knitting machines.
- 5. Needle Controls – Cams, Control sinkers, machine memory.
- 6. Patterning Equipments – For fleecy fabrics, plush fabrics, stripers, Loop transfer.
- 7. Study of weft knitted fabric defects and their remedies, yarn quality requirements. Circular weft knitting machine production calculations, fabric weight and Tightness factor.

LIST OF EXPERIMENTS :-

- 1) General study of projectile m/c. & drive arrangements for various motions.
- 2) General study of flexible rapier m/c. and drive arrangements for various motions.
- 3) General study of Rigid rapier m/c. and drive arrangements for various motions.
- 4) Study of positive cam shedding motion of Sulzer & Ruti-C m/c.
- 5) Study of Rotary mechanical & electronic doobby.
- 6) Study of electronic jacquard m/c.
- 7) Study of single jersey circular weft knitting m/c. – Yarn supply arrangement, loop forming mechanism, take down motion. Production calculation.
- 8) Study of double jersey circular weft knitting m/c. – Yarn supply arrangement, loop forming mechanism, take down motion. Production calculation.
- 9) Design setting on single jersey circular weft knitting m/c. – machine operation, cam and needle arrangement, yarn feeding and take down setting.

- 10) Design setting on double jersey circular weft knitting m/c. – machine operation, cam and needle arrangement, yarn feeding and take down setting.
- 11) Fabric analysis of woven fabric – advanced structures.
- 12) Fabric analysis of knitted fabrics.
- 13) Visit to jacquard unit.

REFERENCE BOOKS :-

1. The Technology of Warp Sizing by J.B. Smith.
2. Modern Preparation & Weaving by A. Ormerod.
3. Textile Maths Vol.III by J.E. Booth
4. Principles of weaving by Marks & Robbinson.
5. Weaving machines & methods by Dr. Talukdar, Prof. D.B. Ajgaonkar.
6. Sizing by Sydel.
7. Shuttleless weaving by Svaty.
8. Modern Methods of Weaving by Duxburng.
9. Hand Book of Weaving – Sulzer Publication.
10. Knitting Technology by Prof.D.B. Ajgaonkar.
11. Circular Knitting by Dr. Chandrashekhar Iyer.
12. Knitting Technology by Mr. D. Spenser.