

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/FT	ADVANCED COMPUTER PROGRAMMING	3	---	---	2	100	25	---	50	175
3.2	TT/MMTT/TPE/TC/FT	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-II	4	---	---	2	100	25	---	---	125
3.6	MMTT	MANMADE FABRIC MANUFACTURE-II	4	---	---	2	100	25	---	---	125
			21	---	---	9	600	100	---	100	800
L =LECTURES T =TUTORIALS DR=DRAWING PR=PRACTICALS			TP=THEORY PAPER TW=TERM WORK OE=ORAL EXAMINATION PE=PRACTICAL EXAMINATION								

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-III	4	---	---	2	100	25	---	50	175
4.6	MMTT	MANMADE FABRIC MANUFACTURE-III	4	---	---	2	100	25	---	50	175
4.7	TT/MMTT/FT	TEXTILE DESIGN & COLOUR	---	---	2	---	---	50	---	---	50
			20	---	2	8	600	150	---	150	900
L =LECTURES T =TUTORIALS DR=DRAWING PR=PRACTICALS			TP=THEORY PAPER TW=TERM WORK OE=ORAL EXAMINATION PE=PRACTICAL EXAMINATION								

SECOND YEAR B. TEXT. – SEMESTER – I**3.1 ADVANCED COMPUTER PROGRAMMING (TT/MMTT/TPE/TC/FT)**

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

1. Networking Concepts:

Introduction to network, use of computer networks, Network Topologies, Network types - LAN, MAN, WAN, Network hardware Components - cables, connectors, NIC, Hub, Switch etc. Network Operating system, Client / Server Architecture, Internet and its applications. Switching and routing in network, The X.25 network & supporting protocols, TCP/IP

2. Database Management

Introduction to database, Records, Relational database management systems, structural query languages (SQL), SQL table creation integrity constraints, insertion of records, select statement, alter command, drop table partitioned table, SQL operator, transaction processing, where clause, like operator, between operator, order by clause, group by clause, having clause, SQL function , commands - Select, Insert, update, delete, joins - inner join, outer join, equijoin.

3. Analysis of Information System:

Types of information, information processing for store- overview, overview of design of an information system, role & attribute system analyst, tool for system analyst

4. Visual Basic Fundamentals:

Introduction, projects in visual basic, project explorer, setting project. Options, Visual Basic code - understanding procedures, subroutines, Functions, comments, code window & its features, controlling program flow, conditional branching, loops.

5. Visual Basic Data Types:

Data types in visual basic, - byte, integer, long, single, double, currency, Boolean, data, string, object, variant, declaring variables, variable scope & life time, data conversion, arrays, constants, user defined data types.

6. Designing User Interface:

Forms, form properties, form events, loading, unloading, showing & hiding Forms controls in visual Basic - label, buttons, text box, list, dropdown Selection list, checkbox, option button, timer control, setting tab order, Menus in visual basic. Message box, input box, common dialog. Data report.

7. Programming Database Access:

Introduction, Record set object - definition, properties, methods & events, Records, working with record set in code, visual basic data control, Introduction to ADO.

8. Introduction To .Net

Need of vb.net, .Net framework, features of and architectures of vb. net, introduction to visual studio, .Net IDE interface and event driven programming. Creating application building projects using simple components running VB.NET application.

9. Introduction of ERP

Evolution of ERP, growth of ERP, Need for system interaction and interface, early ERP packages, various models of ERP, advantages of ERP, Overview of enterprise, integrated management, business modeling ERP for small business, business process for ERP module design, opportunities and problems in ERP selection and implementation, hardware Environment.

List of Experiments:-

1. Study of basic concept of computer network.
2. Study of network System with commands from Novell Network.
3. Creating databases, tables using Ms-access.
4. Creating & manipulating Database using Oracle.

5. Working with SQL Commands like Select, Insert, Update, Delete, etc.
6. Creating simple form in Visual Basic.
7. Writing applications in Visual Basic using multiple forms, various controls (like radio button, list etc.) and database application using data control for
Finding mean, SD, CV% of yarn strength testing machine
Finding twist & its SD, mean & CV%
To calculate production of winding m/c, warping m/c, sizing m/c, looms, (Weaving Machine.), blow room, card, speed frame, ring frame etc (Spinning Machine).
8. Finding % exhaustion of dye bath.
9. Application program using VB ADODC- 2 Programs
10. Application program using VB.Net- 2 Programs

Reference Book:-

1. Computer Network - by Andrew Tanenbaum
2. Database System - by Korth
3. Black Book VB 6.0 - by Holzner
4. Analysis & Design of information System- by Rajaraman

SECOND YEAR B. TEXT. – SEMESTER – I

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

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

1) Differential equations of first order & first degree:

Method of solving Exact, Non exact, Linear and Non-linear differential equations.

Numerical solution of o.d. equations by Euler,s method and Runge Kutta method of fourth order. (6)

2) Applications of ordinary differential equations:

Applications for solving simple electrical circuit problems and mechanical problems (4)

3) Linear differential equations of nth order with constant coefficients:-

Methods of finding Solution of L.D. equations in the form $y = C.F. + P.I$
Cauchy,s homogeneous linear differential equations with constant coefficients and there solution. (7)

4) Applications L. D. equations of nth order with constant coefficients:

Applications for solving simple electrical circuit problems and mechanical problems (4)

5) Testing of hypothesis:-

Introduction, Hypothesis, Statistic, Critical Region, Errors in testing, Level of Significance. (2)

6) Large sample tests:-

Test for population mean, equality of population means population proportion & equality of population proportions. (4)

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 coefficient.

(7)

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 X^2 distributions,

(3)

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.

(4)

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 Hours / 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 Polymerization :-

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 polymerization – 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-polymerization :-

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 M_n , M_w and poly-dispersibility & their significance. Effects molecular weight distribution of polymer on spinnability & drawability. Light scattering and ultra centrifuge techniques to determine M_w . Endgroup analysis, osmotic pressure, cryscopic methods & viscosity methods to determine M_n & 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 MAN MADE FIBRE MANUFACTURE-I (MMTT)**

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

Structural Principles of Textile Fibres:-

Structural principles of fibre forming polymers: Fibre forming processes, molecular size & its 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 flow and elongational flow, Formation of fibre structure: molecular orientation & crystallinity.

Principles of Melt Spinning:-

General features of the melt spinning process, Melt spinning devices such as extruders, static mixer, pre-filtration, manifold, spinpack, cooling devices, T-up winders. Melt spinning variables and calculations related to production, spinning pump speed and polymer output rate. 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. Direct melt spinning, High speed spinning, staple fibre production process, spin draw process, some special spinning methods.

Spin finish: Composition of spin finish, Requirements of good spin finish, Methods of application of spin finish.

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 behavior of different yarns, settability and measurement of degree of set.

List of Experiments:-

1. Demonstrations 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. Effect of temperature and thermal treatment on MFI and Melt Index Spread of polyolefins.
5. Effect of melt spinning process variables on characteristics of filament yarn- Part-I
6. Effect of melt spinning process variables on the characteristics of filament yarn- Part-II.
7. Comparison of cold drawn and hot drawn filament yarns.
8. Comparison of properties of single and multi stage drawn polyesters filament yarns.
9. 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 MAN MADE STAPLE YARN MANUFACTURE-II (MMTT)

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

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 in 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 – Tandem 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) Concept of Air engineering w.r.t. carding.
- i) Utilities required for carding machine.

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.
- g) Role played by air on Drawframe and utilities required.

List of Experiments:-

- 1) Study of chute feed system
- 2) Study of constructional details of a card.
- 3) Driving arrangement and calculations of carding machine.
- 4) Settings of various parts of feed zone of carding.
- 5) Settings of various parts of carding zone in carding.
- 6) Demonstration of stripping, Grinding, wire mounting, etc. – Mill visit.
- 7) Study of utilities on card & Draw frame.
- 8) Processing of Material on card and evaluating card performance.
- 9) Study of constructional details of draw frame.
- 10) Driving arrangement and calculation of D/F.
- 11) Evaluation of Draw frame performance.
- 12) Study of autolevellers used on card and Draw frame.

Reference Books:-

- 1. The Textile Institute Publication –Manual of Textile Technology-Short Staple Spinning Series Vol I to V by W. Klein
- 2. The characteristics of Raw Cotton by P. Lord. The Textile Institute Publication, Manual of Cotton Spinning Vol II, Part-I.

3. Opening and cleaning by Shirley. The Textile Institute Publication, Manual of Cotton Spinning Vol II, Part II.
4. Opening cleaning and picking by Dr. Zoltan, S. Szaloki, Institute of Textile Technology, Virginia.
5. Fundamentals of Spun Yarn Technology, By Carl Lawrence.
6. Blow room and carding –Training program conducted by NCUTE, IIT Delhi.
7. Carding by F. Charanlay .The Textile Institute publication, Manual of cotton spinning series Vol - III.
8. Essential calculations of practical cotton spinning by T. K. Pattabhiraman.
9. Blow room, Carding, Draw frame-by Prof. A. R. Khare
10. Technology of cotton spinning by J. Janakiram.

SECOND YEAR B. TEXT. – SEMESTER – I**3.6 MAN MADE FABRIC MANUFACTURE-II (MMTT)**

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

1) AUTOMATIC WEAVING:-

- i) Limitations of ordinary looms: - Production, efficiency, quality & allocation, objectives for developing automatic looms, scope for automation.
- ii) Design features of automatic looms: - Drives, loom motions, accessories & other critical features of automatic looms.
- iii) Weft feelers: - Construction working of side sweep (Cimmco & Ruti-B Type), electrical (Ruti-C Type) & electronic weft feelers, their merits, demerits & applications.
- iv) Transfer mechanism: - Cimmco & Ruti-C transfer motion's 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.
- v) 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.
- vi) Warp stop motion: - Types, Construction and working of mechanical and electrical warp stop motion, Types of drop pins, specifications & applications.
- vii) Centre weft fork: - Construction & working of Ruti-C type center weft fork motion & its advantages.
- viii) Operator assisting motions: - Pick finding, heald leveling, light indicators, pick counters need, functions & use.
- ix) Auto loom fabric defects, causes and remedies, Calculations.

2) FABRIC STRUCTURE:-

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

- i) Stripe & check weave combination - selection of weaves, joining of weaves, firmness, classification & construction of designs.
- ii) Colour & weave effect.
- iii) Simple spot designs.
- iv) Backed fabrics - Warp, weft and wadding backed fabrics.
- v) Bedford cords - Plain, twill, wadded, Crepon cords,
- vi) Welt & Pique: - Plain, wadded & waved pique.
- vii) Figuring with extra threads: - Principles, extra warp, extra weft figuring, combination, limitation, extra thread effect & weaving.
- viii) 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 doups, easing & shaker motion concept, working & construction.
- ix) Double cloth: - Object, classification, self stitched double cloth; center stitched double cloths, interchanging double cloth, multiplayer fabrics. Selection of face & back weaves type of stitching points & their selection, wadded double cloth.

3) **AUTOMATIC WINDING:-**

- a) Classification of automatic winding machine P & Q winding, their application.
- b) Technical requirements of winding process :
 - i) Yarn unwinding
 - ii) Yarn take-up
 - iii) Yarn tensioning
 - iv) Wound package requirements for warping, knitting & weaving.
- c) Construction of automatic winding machines
 - i) Design features, i.e. yarn path (Creel, link presenter, booster, unwinding accelerator, pre cleaner, tensioners, waxing cradle etc.)
 - ii) Drive to drums, scroll details, super drums, braking etc. (Autoconer - 238,338,338 0, Savio Espero & Orion, Murata - 21 C, 7 -V.)
 - iii) Special features of all models, blowers, air consumption & power etc.
- d) Yarn Clearing :-
 - i) Technical back ground

- ii) Optimum clearing.
 - iii) Uster Classimat as an aid for yarn clearing.
 - e) Electronic yarn clearers
 - i) Optical & capacitance, Loefe, TK 930F, TK 950H, Quantum-II etc.
 - ii) The capabilities of different yarn clearers.
 - iii) 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.
 - iv) Siro cuts.
 - v) Knot factor & clearing efficiency & its use as an aid to assess the performance of winding machines.
 - f) Splicing :-
 - ii). Types - mechanical & pneumatic, details of construction, parameters, their applications.
 - iii). Electronic checking of spliced joint.
 - iv). Splice quality assessment (strength, appearance, hairiness)
 - v). Maintenance of splicers.
 - g) Study of various delivery packages.
 - h) Package Quality :-
 - i). Details of package faults observed on automatic winding machines causes & remedies.
 - ii). Mechanism for anti patterning, maximum diameter of package, all to doffing & restarting.
 - i) Calculations: - Efficiency, production & allocation.
- 4) MODERN WARPING:-**
- a) Constructional details & features of modern warping machines. Such as Benninger, West Point, Sucker-Muller, Tsudakoma & Karl Mayer with reference to design of creel, pre-tensioners, automatic adjustment of central control of tensioners.
 - b) Types of re creeling - magazine, truck, chain creels, semi - auto & auto creels, creel - master, and auto plan for colour patterns.
 - c) Head Stock - i) Beam warping - Auto leasing, drive, brakes and automatic doffing & donning.

- ii) Sectional warping - Auto leasing, drum traverse & cone angle adjustment, beam traverse & its adjustment.
- iii) MIS systems & its use.

List of Experiments:-

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

SECOND YEAR B. TEXT. – SEMESTER – II**4.1 THERMAL AND AIR ENGINEERING (TT/MMTT/TPE/TC)**

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

1. Introduction – Laws of Thermodynamics – Zeroth Law, First Law, Second law of Thermodynamics. Thermodynamic Processes – constant volume, constant pressure, constant temperature, adiabatic, polytropic & throttling process with P-V & T-S diagrams and numericals..
2. Air Standard Cycle – Introduction, Assumptions in thermodynamic cycles, Important terms used in thermodynamic cycles, efficiency of a cycle, representation of Carnot cycle, Otto cycle, Diesel cycle, on P-V and T-S diagram and numericals.
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.
Use of steam in textiles – Sizing, Wet processing and numericals based on properties of steam.
4. Steam Boilers – Introduction, Classification of boilers, Study & construction of fire tube boilers such as Cochran boiler, Lancashire 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, Application in Textile industry.
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-S 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, Screw compressor, Centrifugal compressor, Axial flow compressor. Pumps – Reciprocating, Centrifugal (working and principle only).
10. Introduction to Pneumatics –
 - (a) Pneumatic Circuits – Symbols of cylinder, control valves, check valves.
 - (b) Air treatment – Symbols for Air filter, Refrigerated dryer, Lubricators.
 - (c) Control valves – Symbols for Poppet valve, Pilot operated check valve and spool valve.
 - (d) Application of Pneumatic circuits in Textile machines.

Reference Books:-

1. A Textbook of Engineering Thermodynamics by R.K. Rajput.
2. Thermal Engineering by R.S.Khurmi & Gupta.
3. Elements of Heat Engines (Vol. I & II) by Patel, Karamchandani.
4. A course in Refrigeration & Air conditioning by Arora & Domkundwar.
5. Pneumatic Systems by Majumdar.
6. Hydraulics & Pneumatics by Andrew & Parr.
7. Humidification & Air conditioning by S. P. Patel.
8. Textile Humidification by K. G. Vaze.

SECOND YEAR B. TEXT. – SEMESTER – II**4.2 TEXTILE MATHEMATICS-IV (TT/MMTT/TPE/TC/FT)**

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

1. Laplace Transforms: -

Definition, transforms of standard functions, transforms of derivatives, and integrals. Inverse Laplace transforms by partial fraction and convolution method. (6)

2. Applications of Laplace Transforms for solving L.D. equations:-

Method of solving L. D. equations with initial conditions (Boundary Values) with the help of Laplace Transforms. (3)

3. Vector differentiation:-

Differentiation of vector valued function of scalar 't', gradient, divergence, curl, directional derivative. Solenoidal and irrotational vector fields. (5)

4. Fourier Series:-

Definition, Euler,s formulae, Conditions for fourier expansions. Full range fourier series and half range expansions and their examples. (6)

5. Analysis of Multivariate Data:-

Multiple and Partial correlation coefficients. Plane of regressions. (4)

6. Analysis of Variances:-

Introduction, One-way Classification, Two-way Classification with and without repetition. (5)

7. Design of Experiments:-

Introduction, Basic principles, Basic Designs (CRD, RBD & LSD). (7)

8. Factorial Experiments:-

Introduction & types, 2^n factorial experiments, 2^2 & 2^3 factorial experiments. (4)

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 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

CHAPTER – 1 SIZING

- Objects of sizing.
- Size paste ingredients & their functions.
- Adhesives and its classification.
- Study of Maize starch, Potato, Thin boiling starches, Starch ethers and Starch esters.
- TKP, LTKP,
- Carboxy methyl cellulose.
- Synthetic adhesive like Polyvinyl alcohol.
- Viscosity, keeping and congealing properties of starch.
- Testing of adhesives.
- Functions of Softeners & Lubricants.
- Testing of softeners.
- Functions of antiseptics, some organic and inorganic antiseptics used in sizing.
- Functions of weighting agents, study of weighting agents like china clay gypsum salt, French chalk & Barium salt.
- Size paste formulation for cotton (20^S, 40^S,60^S,100^S), viscose, P/C, P/V

CHAPTER – 2 GREY INSPECTION

- Importance of grey inspection, defect analysis - flow based & point based.
- Four point & ten point system & numerical for acceptance & rejection of fabric.
- Use of different colour tags for different processes & defects.
- Inspection machines for woven & knit goods.

CHAPTER – 3 PRETREATMENTS

- Introduction of pretreatments in wet processing.
- Introduction to shearing and cropping machines. Objects, working principle, types of shearing.
- Objects of singeing.
- Methods of singeing - gas singeing for woven & knitted fabrics
- Introduction to efficiency of singeing
- Evaluation & efficiency of singeing

CHAPTER – 4 DESIZING

- Objects of desizing.
- Mechanism of desizing.
- Inter-relation of desizing with singeing and sizing
- Various methods of desizing: Hydrolytic & oxidative method of desizing.
- Evaluation of efficiency of desizing.

CHAPTER – 5 SCOURING

- Object of scouring.
- Scouring with alkali & solvent assisted desizing.
- Inter-relation between desizing and scouring.
- Study of batch-wise & continuous methods of scouring
- Concept of bio-scouring
- Evaluation of efficiency of scouring

CHAPTER – 6 BLEACHING

- Objects of bleaching.
- Introduction to bleaching agents like sodium hypochlorite ,hydrogen peroxide & per-acetic acid.
- Bleaching of cotton, polyester & its blends.
- Batch-wise & continuous machinery for bleaching
- Bleaching of wool ,silk
- Concept of AOX
- Evaluation of efficiency of bleaching.

CHAPTER – 7 MERCERIZATION

- Introduction & objects of mercerization
- Effect of mercerization on structure of cellulose.
- Machinery used for yarn, woven and knit fabrics.
- Concept of hot mercerization & liquid ammonia mercerization.
- Testing methods to evaluate efficiency of mercerization like Barium Activity Number, Axial Ratio & Luster index.

List of Experiments:-

- 1) Identification of adhesives by microscopic method.
- 2) Testing & analysis of adhesive.
- 3) Testing & analysis of purity of softener.
- 4) Estimation of size % in grey fabric.
- 5) Acid and enzymatic desizing of cotton & PIC blends.
- 6) Scouring of cotton and PIC blend.
- 7) Bleaching of woven & knitted cotton fabrics.
- 8) Determination of mercerization efficiency by BAN method.
- 9) Degumming of silk.
- 10) Scouring & bleaching of wool.
- 11) Determination of whiteness, yellowness of bleached fabric by CCM .
- 12) Formulation of size recipe & testing the performance using single end sizing machines.
- 13) Visit to sizing unit and process house.

Reference Books:-

1. Sizing by Prof. D. B. Ajgaonkar, Dr. 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. Mercerization by J.T. Marsh.
6. Introduction to Textile Bleaching by J. T. Marsh.
7. Bleaching, Dyeing & Chemical technology of textiles fibres by S. R. Trotman.
8. Technology of Bleaching by V. A. Shenai.

9. Wrap Sizing by Paul V. Seydel.
10. Warping & sizing by BTRA Silver Jubilee Monograph Series.
11. Bleaching & mercerizing by BTRA Silver Jubilee Monograph Series.
12. Chemical Technology in the pretreatments of textiles by S. R. Karmarkar
13. Textile sizing by Bhuvanesh C.Goswami.

SECOND YEAR B. TEXT. – SEMESTER – II

4.7 TEXTILE DESIGN AND COLOUR (TT/MMTT/FT)

Drawing	:	2 Hours / Week
Practical Exam	:	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. Ogee base
 - 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 (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.

Reference Books:

1. Willian Watson “Textile design and colour”: Elementary weaves and figured fabrics.
2. N. Gokarneshan “Fabric structure and design”.
3. Doris Goerner “Woven Structures and Design “

SECOND YEAR B. TEXT. – SEMESTER – II**4.3 MAN MADE FIBRE MANUFACTURE-II (MMTT)**

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 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 fibre/ filament yarns, their production, properties and applications. Polyester 3GT fibre-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 and study of their characteristics.
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. Demonstration of air-covering machine and manufacturing of air covered yarns.
8. Effect of process variables of air-covering machine on yarn characteristics

9. Effect of heat-setting temperature on the dimensional stability of filament yarns.
10. 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-I – V.A. Shenai.

SECOND YEAR B. TEXT. – SEMESTER – II

4.5 MAN MADE STAPLE YARN MANUFACTURE-III (MMTT)

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 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 materials handling. Stop motions in comber.
- G. Technical specifications of modern combers available in the world market.
- H. Utilities for Modern comber

2 . 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. Materials handling. Transport of bobbins to ring spinning machines.
- F. Maintenance of speed frame.
- G. Features of modern speed-frame machines available in the market.
- H Utilities for Modern speed frame

List of Experiments:-

- 1) Driving arrangement & calculations of Sliver lap machine. Roller settings in Sliver lap machine.
- 2) Driving arrangement & calculations of Ribbon lap machine. Roller settings in Ribbon lap machine.
- 3) Study of constructional aspects, combing cycle & index chart of modern comber.
- 4) Driving arrangement & calculations in modern comber.
- 5) Driving arrangement & calculations related to production, constants, draft twist etc. of modern speed frame.
- 6) Comber setting.
- 7) Study of coils per inch of speed frame & differential gearing.
- 8) Study of building mechanism of speed frame.
- 9) Mill visit to study modern Comber, Speed frame.
- 10) To study the utilities required for Comber preparatory, Comber, Speed frame
- 11) Assessment of performance of comber preparatory
- 12) Assessment of performance of comber .
- 13) Assessment of performance of Speed frame.

Reference Books:-

1. The Textile Institute Publication –Manual of Textile Technology-Short Staple Spinning Series Vol I to V by W. Klein Vol III-A Practical training guide to Combing & Drawing by W. Klein
2. Practical guide to combing by W. Klein, Textile Institute publication Vol.3
3. Fundamentals of Spun Yarn Technology, By Carl Lawrence.
4. Essential calculations of practical cotton spinning by T. K. Pattabhiraman
5. Technology of cotton spinning by J. Janakiram.
6. Drawing, Combing and roving and speed frame by Zoltan, S. Szaloky, The
7. Institute of Textile Technology, Virginia
8. Draw frame, combing and speed frame by J. H. Black; The Textile Institute publication, Manual of cotton spinning Vol-IV part II.
9. Combing by Moor.
10. Spun Yarn Technology by Eric Oxtoby.
11. Elements of combing by A. R. Khare.
12. Cotton Drawing and Roving by G. R. Merrill.
13. Manual of cotton spinning series, vol3, part 2 by J. Black et al Textile Institute Publication.

SECOND YEAR B. TEXT. – SEMESTER – II

4.6 MAN MADE FABRIC MANUFACTURE-III (MMTT)

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term Work	:	25 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) **FABRIC STRUCTURE:-**
- a) Study of following weave on weave characteristics & weaving requirements.
 - 1) Warp pile - wire method, face to face weaving & terry pile.
 - 2) Introduction to tufted carpets.

- 3) Weft pile - velveteens & velours
 - b) Fabric Engineering:-
 - 1) Peirce's yarn diameter formula & its limitations.
 - 2) Fabrics cover & crimp factors.
 - 3) Cloth geometric of plain, twill and combination weave.
 - 4) Concept of Tightness factor.
 - 5) Practical application of cloth geometry & cover factor.
 - c) Construction & Development of Jacquard Designs:-
 - 1) Elements of Jacquards shedding - Double lift, Jacquard with single & double cylinder working, Jacquard sizes, Harness tie, Harness drawing - in, card cutting & card lacing.
 - 2) Harness & design calculation - Setting of harness, number of harness cords to each hook, casting out, size of repeat, count of design paper.
 - 3) Development of Jacquard Designs - Construction of square paper designs, Process of drafting a sketch design, drafting designs from woven fabrics.
 - 4) Development of figures - Prevention of long floats, bold & flat development, Development of large figures, use of warp & weft float, figure shading.
 - 5) Insertion of ground weavers.
 - 6) Factors influence woven designs.
- 3) SHUTTLELESS WEAVING:-**
- a) Limitations of shuttle loom with respect to weaving process, engineering aspects & environmental aspects.
 - b) Classification of shuttle less weaving machines.
 - c) Projectile weaving machine - History of shuttle less weaving machine; Projectile machine models TW-II To P7300 ; 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. Selvage 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 selvage formation.

Detailed study of Dornier rapier weaving machine on above line.

List of Experiments:-

1. Dismantling and resetting of warp stop motion.
2. Study of shuttle change motion and silk loom features.
3. Loom operating - starting, stopping, knotting, & drawing -in & study of fabric defects.

4. General study of projectile machine and drive arrangements for various motions.
5. General study of flexible Rapier machine & drive arrangements for various motions.
6. General study of rigid Rapier machine & drive arrangements for various motions.
7. Study of positive cam motions of Sulzer & Ruti-C machine.
8. Study of Rotary mechanical & electronic dobby.
9. Study of electronic jacquard motion.
10. Fabric analysis of advanced structures.
11. Fabric analysis of advanced structures.
12. Fabric analysis of advanced structures.
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.