Maharshi Dayanand University
Rohtak

Syllabus and Courses of Reading for

Bachelor of Technology (B. Tech.)

(Textile Technology/Textile Chemistry)

Examination

Session—~~1998-99~~ 1999-2000

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MAHARSHI DAYANAND UNIVERSITY ROHTAK
SCHEME OF STUDIES FOR THE FOUR YEAR B.TECH (TEXTILE TECHNOLOGY) COURSE 1998-99
B.TECH (TEXTILE TECHNOLOGY)
(COMMON WITH TEXTILE CHEMISTRY)

FIRST SEMESTER

SUBJECTS

Index No.	Theory Papers	Hours Per Week
MA 101	Mathematics-I	3
CH 103	Chemistry-I	3
PH 105	Physics-I	3
SS 107	English	3
TT 109	Textile Raw Materials	3
CS 111	Computer Concepts & Programming	3
		18
	PRACTICALS	
EN 113	Workshop Practice	6
CH 115	Chemistry practical	4
PH 117	Applied Physics Practical	6
		34

SECOND SEMESTER

THEORY PAPERS

MA 102	Mathematics-II	3
CH 104	Chemistry-II	3
PH 106	Physics-II	3
EN 108	Applied Mechanics	3
TT 110	Introduction to Textile Processes	3
SS 112	Industrial Economics & Labour Laws	3
		18
	PRACTICALS	
EN 114	Mechanical Workshop	4
CH 116	Chemistry Practical	4

PH 118	Applied Physics Practical	4
EN 120	Engineering Graphics	4
		34

SCHEME OF EXAMINATION FOR THE FOUR YEAR B.TECH (TEXTILE TECHNOLOGY)

B.TECH FIRST AND SECOND SEMESTER EXAMINATIONS (COMMON WITH TEXTILE CHEMISTRY)

SUBJECTS

Index No.	Theory Paper	No. of Papers	Time (Hrs.)	Marks of Paper	Marks of C/work	Total Marks
MA 101	Mathematics-I	1	3	100	50	150
CH 103	Chemistry-I	1	3	100	50	150
PH 105	Physics-I	1	3	100	50	150
SS 107	English	1	3	100	50	150
TT 109	Textile Raw Materials	1	3	100	50	150
CS 111	Computer Concepts & Programming	1	3	100	50	150
MA 102	Mathematics-II	1	3	100	50	150
CH 104	Chemistry-II	1	3	100	50	150
PH 106	Physics-II	1	3	100	50	150
EN 108	Applied Mechanics	1	3	100	50	150
TT 110	Introduction to Textile Processes	1	3	100	50	150
SS 112	Industrial Economics & Labour Laws	1	3	100	50	150
	PRACTICALS					
EN 113	Workshop Practice	1	4	75	75	150
EN 114	Mechanical Workshop	1	4	75	75	150
CH 116	Chemistry Practical	1	4	100	50	150
PH 118	Applied Physics Practical	1	4	100	50	150
EN 120	Engineering Graphics	1	3	75	75	150

MAHARSHI DAYANAND UNIVERSITY ROHTAK
SYLLABUS FOR B.TECH (TEXTILE TECHNOLOGY)
(COMMON WITH TEXTILE CHEMISTRY)

FIRST SEMESTER

MA 101 Mathematics-I **3/150**

Differential Calculus: Expansion of function (only Taylor's infinite series), Tangent, Normal and Radius of curvature, Envelope, Asymptotes, partial differentiation, maxima and minima of functions of two or more variables.

Integral Calculus: Double and Tripple integrals, change of order of integration, change of variables. Tracing of simple curves, application to areas. Gamma and Beta function.

Differential Equation: Ordinary differential equations of first order but not first degree. Linear differential equation with constant coefficients. Euler-Cauchy equation, method of variation of parameters for second order differential equation.

Equations of the form $(d^2y/dx^2) = f(x)$. Simple application and solution of differential equation in series.

CH 103 Chemistry-I **3/150**

pH and Buffer Solution: Hydrogen on concentration and its determination using = (i) Hydrogen electrode (ii) Glass electrode and (iii) quinhydrone electrode. Determination of pH of an aqueous solution of acids and bases. Importance of pH and Buffer solutions; Preparation, properties and uses of Buffer solutions.

Water Treatment: Impurities in natural water, Hardness of water, removal of hardness by different methods, degree of hardness, measurement of degree of hardness by acid titration method and Soap Solution Method.

Colloids: Colloidal state, types of Colloids, Sols: Definition, types, preparation, purification, properties, origin of charge, coagulation and protective action. Application of Colloids.

Emulsions: Definitions, types, preparation and properties.

Corrosion: Definition, theory of corrosion, factors influencing the rate of corrosion and control metallic coating cathodic protection and corrosion inhibitors.

Oxidation - Reduction: Definition, Oxidising and reducing agents; peroxide, chloride, hydro sulphite, sulphite, potassium permanganate. Balancing of Redox reaction by oxidation number method, Ion Electron Method.

Chemical Bonding: Introduction, molecular approach to covalent bonds, formation, comparison between V.B. and M.D. theories. Polarity of covalent bonds and electron bond metallic bonding, Hydrogen bonding; reasonance etc.

Introduction to Environmental Pollution: Definition type and source of air and water pollution. Some methods to minimise pollution in air and effluent from Industries, Introduction of Oxygen Demand (B.O.D.) and Chemical Oxygen Demand (C.O.D.) Hygienic requirement of water.

PH 105 Physics-I **3/150**

Introduction to Laser and Maser: Basic principles of Laser and Maser. Threshold conditions and pumping. Population inversion, He-Ne and Ruby Lasers (principle construction and working). Semi-conductor lasers-main features and conditions of laser action. Uses of lasers and limitations.

Elasticity: Fundamentals of Elasticity - Work done per unit volume in strain. Concept of Poisson's ratio. Resilience of elastic body. Ductile and brittle bodies and their elastic behaviour. Elastic constants. Twisting couple on a cylinder. Longitudinal strain filaments. Bending moment and its magnitude. Cantilever (neglecting the weight of beam), Depression of beam loaded at the centre. Determination of 'Y' by bending of beam.

Viscosity: Fundamentals of viscosity. Fugitive elasticity. Poiseuille's equation for flow of liquid through cappilary. Motion in a viscous medium. Stoke's law and determination of coeff of viscosity.

Diffusion and Osmosis : Fick's law of diffusion, relation between time of diffusion and length of column. Osmotic pressure, semi permeable membrane and dialysis. Breakeley and Hartely method for measuring osmotic pressure. Laws of osmotic pressure-effusion (transpiration and transfusion). Isotonic solutions. Osmosis and vapour pressure. Influence of temperature on osmosis.

Simple harmonic motion (SHM): Differential equation of SHM. Energy of a particle executing SHM.

SS 107 English **3/150**

A course in written English designed to improve student's skill in the use of language. Since this course is meant for the students who have already studied the fundamental principles of languages, its primary aim will be an extension of the students' range of comprehension and an improvement in their expression. The course will include the following.

Comprehension (reading a passage for comprehension so as to be able to answer questions based on it).

Precis writing (Summarising a passage and assigning a suitable heading).

Business Correspondence: Principles of correspondence/planning a letter/quotations, orders and tenders, sales Latters, claim and adjustment letters, Applications.

Grammar and Usage: use of articles, use of prepositions, agreement of verb and subject, tenses in conditional sentences, correct and incorrect sentences.

Gaining precision in the use of words, words often confused because of similarity in meaning, pronunciation or spelling.

Report writing: Types of Reports, structure of reports, use of illustrations and writing of reports. Oral presentation of reports and taking part in meetings, discussions and conferences

Scheme of the question paper

The question paper may ordinarily contain ten questions out of which students may be asked to attempt any five. The questions will provide internal choice also. In questions pertaining to Grammar and usage, students may be asked to use words in their own sentences, correct some incorrect sentences, fill in blanks, complete some incomplete sentences or rewrite sentences with desired changes.

TT 109 Textile Raw Materials **3/150**

Survey of world sources of textile fibres (natural and manmade) and their utilisation. General classification of fibres.

Geographical distribution, cultivation, properties and uses of various varieties of cotton.

Cultivation, extraction, properties and uses of best and leaf fibres such as Jute, hemp, sisal and remie.

Varieties of natural Silk. Rearing of silk warm. Properties and uses of various types of silk; silk reeling, throwing and weighing.

Varieties, sorting and grading of wool, chemical and physical properties of wool, process involved in removal of impurities from raw wool, numbering systems of woolen and worsted yarns.

Brief outline of the manufacturing process of the more important man made fibres, viz. Rayons (Visconse and Acetate) nylons, polyester, acrylics. Polyprophylen and polylefin with their flow charts. Introductory idea about the physical and chemical properties and uses of such manmade fibres.

CS 111 Computer Concepts and Programming 3/150

Modern Computer Systems, Computer types and their origin, Computer elements and operation. PMS and structured notation of Computer. Data Information, Data types and data representation, Number systems, flow-charts and Algorithms, Operations (Arithmetic and logic).

Input/out devices, media, methods and uses. Boolean algebra. Logic gates and Truth tables. Logic circuits of Half adder, full adder, Encoder and Decoder. Operating systems (purpose and facilities).

Basic features of FORTRAN (Formula translation) programming.

EN 113 Workshop Practice 4/150

Introduction and use of simple hand tools and measuring instruments. The care and maintenance of tools and equipment and the safety regulation pertaining to workshop activities.

Execution of simple process exercises in a step by step sequence of basic processes. vis. marking filing, drilling, tapering, threading and simple machining.

Selection of tools and their grain influence on joint methods, making of different types of joints. Pattern allowance. Making a single piece pattern.

SECOND SEMESTER

MA 102 Mathematics **3/150**

Tensor: Vector differentiation, Gradient, Divergence and Curl. Use of general orthogonal curvilinear systems, Tensors-addition, Multiplication and contraction-differentiation tensors.

Matrices: Rank of Matrix, Consistency of linear equations, Eigen-values and Eigen-vectors of Matrix, Cayley-Hamilton theorem, Orthogonal, Hermitian, Skew-Hermitian and Unitary Matrices, Bilinear and Quadratic forms.

Laplace Transformation: Definition of Laplace Transform, Laplace transform of some elementary functions. Some important properties of Laplace Transforms, Application to ordinary differential equation.

Numerical Analysis: Linear interpolation (Only Newton forward and Backward and Langrange's interpolation), differences, Numerical Integration (Simpson's and Trapezoidal rule).

Complex Variable: Functions of a complex variable. Differentiation. Analytic functions. Cauchy-Reimann equations. Conjugate functions.

CH 104 Chemistry-II **3/150**

Structural concept of Organic Molecules: Introduction/Inductive effect, Mesomeric effect, Electrometric effect, Hyperconjugation, Resonance . Effect of these factors related to physical and chemical properties of substance.

Organic Reaction and Mechanism: Substitution-Introduction, Classification, Electrophillic, Nucleophillic and free radical substitution reactions in brief.

Addition - Introduction, Classification, addition reactions to compounds containing only one double bond. Addition to carbon-carbon double bond and addition to carbon-oxygen double bond with their mechanism.

Elimination - Introduction, Classification, Beta and Alpha elimination reactions with mechanism in brief.

Free radical reaction in brief.

Stereo Chemistry: Introduction, Classification, Structural, geometrical and optical Isomerism.

Polymers and Polymerisation: Introduction, Physical properties of the polymers, mechanism of polymerisation, co-polymers, Co-polymerisation, Classification of polymers, Chemistry of some polymer fibres in brief.

Cellulose: Introduction, Physical and Chemical properties, Industrial application of cellulose.

Oils, Fats, Soap and Detergents: General, Physical and Chemical properties, Analysis of oils, fats and soaps. Synthetic deterrents in brief.

PH 106 Physics-II **3/150**

Conductors and IC's - Introduction to semi-conductors, conductors, insulators and their resistivity. Intrinsic and extrinsic semi-conductors. Classification of conductors, insulators and semi-conductors according to forbidden energy gap. Difference between conductors and semi-conductors. Electrical conductivity of semi-conductors. P-N junction and biasing, AC resistance of junction. Junction transistors (NPN and PNP). Fabrication of IC's Different types of IC's. Fabrication of monolithic IC's. Formation of resistors, capacitors, diodes and transistors and IC's (chip). Advantages and disadvantages of Semi-conductors devices.

X-rays and Crystallography: Crystalline solids and glassy solids. Unit cell, /crystal lattice Coordination number. Density of packing. SC, BBC, FCC structures, spacing of planes, directional indices and Miller indicates. Procedure of finding Miller indices. Relation between interplanar spacing (d) an cubic edge. X-ray diffraction (Bragg's Law). Powder and Rotation Method for study of crystal structure.

Wave Mechanics: Wave particle dualism. Significance of uncertainly principle and its illustrations.

Optics: Introduction of theories of light. Polarisation and double refraction (birefringence). Polarisation by reflection and scattering. Wire gold polariser. Brewster's Law and Malus Law. Resolving power of optical instruments. Quarter and half-wave plate. Dichroism. Polariods. Fresnel's theory of rotation and optical activity. Specific rotation and half-shade polarimeter.

EN 108 Applied Mechanics **3/150**

Motion - Elements - Pairs and Mechanism. Intertia forces and Dynamical Equilibrium. Friction. Transmission of motion and power. Gear and Gear Trains. Simple stresses and strains. Bending Moments and Shear force Diagrams. banding stresses. Torsion of shafts.

Fluid Properties. Fluid masses subjected to acceleration. Kinematic of fluid flow. Dynamics of fluid flow. Types of fluid Motion. Rectilinear motion. Radial Flow. Rotary or Vortex motion Free Vortex, Forced vortex, cylindrical vortex, spiral vortex.

TT 110 Introduction to Textile Processes **3/150**

Introduction to various processes involved in converting fibres into yarns viz. opening and cleaning, drawing, combing, roving and ring spinning. Concept of yarn quality in spinning. Brief study of winding and doubling processes.

Brief outline of warn winding, pirn winding, beam warping, sizing and weaving processes.

Calculations pertaining to yarn numbering systems and above machines.

SS 112 Industrial Economics and Labour Laws **3/150**

Basic Economic concepts and principles of Economics, Industrial development in India with particular reference to problems of Industries, Cotton Textile Industry of India - Its importance, size structure, problems and remedies. Location of Industries, factors influencing location, selection of site, trends of dispersal of industries in India. Relationalization in Industries. Industrial productivity - Its importance and factors affecting productivity. Export promotion, wages of industrial workers - methods of payment of wages including wage incentive plans, implications of bonus payment. Industrial policy. Industrial financing - fixed and working capital, source of finance, fringe benefits, industrial relations-problems of absentism and turnover, grievance handling, machinery - plant level.

An idea about labour and Factory Legislation, Factories Act/Indian Trade Unions Act, Payment of Wages Act, Industrial Safety Act, Industrial Relation Act.

EN 114 Mechanical Workshop **4/150**

Metal cutting processes related to lathe, shaper, drilling, slotter and milling operations.

Weld preparations and metal deposit by both oxyacetylane and electrical processes. Experiments in moulding, preparation of moulding an study of couples.

Temperature effect in metals in the simple forging processes. Hand forging methods. Processes steps involving upsetting, drawing, bending, punching, drifting and fibre welding.

CH 116 Chemistry Practical **4/150**

Analysis of organic compounds: Detection of elements and functional groups. Eg: Carboxyl, amide, amine, hydroxyl, Phenlic, Aldehyde, Ketoned and unsaturation in hydrocarbon, etc.

Chemical analysis of substance used in Textile Industry: Sodium hydroxide, soda-ash, Bleaching powder, Sodium-hypochlorite, Sodium hydrosulphate, Sodium hydrosulphite and Sodium peroxide, etc.

Analysis of water: Determination of degree of hardness both temporary and permanent by Soap-solution method by standard acid method.

Effluent Testing: Determination of some pollutant substance present in effluent from Industries, Eg. Carbonate, Bicarbonate, Hydroxide, Chlorine Concentration, Chemical oxygen demand (C.O.D.) etc. by volumetric method.

PH 118 Applied Physics Practical **4/150**

Study of the characteristics of Solar Cell.

Determination of self inductance of coil by using AC and DC circuits. Graph between voltage and current (AC and DC)

Study of Magnetic field produced by the passage of electric current through a circular coil.

Study of temperature dependence of iron resistance coil and thermistor. Plot graph between temperature and resistance.

Frequency of AC by using sonometer and electro magnet.

Determination of the coefficient of viscosity of oil by falling drop method (Stoke's method).

Determination of the coefficient of viscosity of water by flow method. Relation between pressure and rate of flow.

Determination of Poisson ratio of rubber and plotting graph between dl and dh.

Determination of diameter and TPM of given yarns by using Coaxial Microscope.

Determination of Young's Modulus by bending of beam. Plotting graph between load and depression.

Dark Room Experiments

Determination of the wave-length of Monochromatic light by using plane diffraction grating.

Determination of the refractive Index of the material of the prism by spectrometer.

Determination of specific rotation and conc. of sugar solution using half shade polarimeter and plotting graph between angel of rotation and concentration.

Investigatory Experiments

Practice in assembling of automatic wireless emergency light using chip 303.

To study the systolic an diasystolic blood pressure of human body under different ambient conditions.

Study of mass specific resistance of fibres by using Bull clip arrangement in ohmic circuit.

EN 120 Engineering Graphics 4/150

Concepts of orthographic projection, lettering and dimensioning, plane geometric constructions. Orthographic projections of point, line and planes, Auxiliary and oblique planes, Generating and contour lines, Intersection of solids. Development of surfaces, Graph and charts. Isometric views.

B.TECH (TEXTILE TECHNOLOGY)
SCHEME OF STUDIES

THIRD SEMESTER

SUBJECTS

Index No.	Theory Papers	Hours Per Week
SP 201	Yarn Manufacture-I	3
WE 203	Weaving Preparation-I	3
WE 205	Fabric Manufacture-I	3
EN 207	Thermal Sciences (Common)	3
EN 209	Electrical Engg. & Electronics (Common)	3
MA 211	Applied Statistics (Common)	3
		18
	PRACTICAL	
EN 213	Electrical Engg. & Electronics (Common)	4
TT 215	Fibre Microscopy & Identification (Common)	2
SP 217	Spinning Practical-I	4
WE 219	Weaving Practical-I	4
EN 221	Machine Drawing (Common)	2
		34

FOURTH SEMESTER

SP 202	Yarn Manufacture-II	3
WE 204	Weaving Preparation-II	3
WE 206	Fabric Manufacture-II	3
WE 208	Fabric Structure-I	3
EN 210	Microprocessor Technology (Common)	3

GT 212	Apparel Industry - An Introduction (Common)	3
		18
	PRACTICALS	
EN 214	Machine Drawing (Common)	4
EN 216	Microprocessor Lab (Common)	4
SP 218	Spinning Practical-II	4
WE 220	Weaving Practical-II	4
		34

B.TECH (TEXTILE TECHNOLOGY) THIRD AND FOURTH SEMESTER SCHEME OF EXAMINATION

SUBJECTS

Index No.	Theory Paper	No. of Papers	Time (Hrs.)	Marks of Paper	Marks of C/work	Total Marks
SP 201	Yarn Manufacture-I	1	3	100	50	150
WE 203	Weaving Preparation-I	1	3	100	50	150
WE 205	Fabric Manufacture-I	1	3	100	50	150
EN 207	Thermal Sciences (common)	1	3	100	50	150
EN 209	Electrical Engg. & Electronics (common)	1	3	100	50	150
MA 211	Applied Statistics (Common)	1	3	100	50	150
SP 202	Yarn Manufacture-II	1	3	100	50	150
WE 204	Weaving Preparation-II	1	3	100	50	150
WE 206	Fabric Manufacture-II	1	3	100	50	150
WE 208	Fabric Structure-I	1	3	100	50	150
EN 210	Microprocessor Technology (common)	1	3	100	50	150
GT 212	Apparel Industry - An Introduction (com)	1	3	100	50	150

	PRACTICALS					
EN 213	Electrical Engg. & Electronics (common)	1	4	100	50	150
TT 215	Fibre Microscopy & Identification (common)	1	4	100	50	150
SP 217	Spinning Practical-I	1	4	100	50	150
WE 219	Weaving Practical-I	1	4	100	50	150
EN 214	Machine Drawing (common)	1	4	75	75	150
EN 216	Microprocessor Lab (common)	1	4	100	50	150
SP 218	Spinning Practical-II	1	4	100	50	150
WE 220	Weaving Practical-II	1	4	100	50	150

B.TECH (TEXTILE TECHNOLOGY)

THIRD SEMESTER

SP 201 Yarn Manufacture-I 3/150

Objects of ginning. Description and working of knife-roller. Mecarthy and Saw gins. Objects of mixing. Principles underlying the different methods of selection of cotton for mixing, their advantages and disadvantages. Study of modern blending machines. Problems in blending of manmade fibre with cotton.

Objects of blow-room, various types of openers, their construction and working. Lap forming mechanisms. Objects and arrangements of calender rollers and their wieghings. Selection of machinery according to the type of cotton and their suitable combinations. Nature of waste extracted in various openers and beaters. Production and efficiency levels attainable for different blow-room machinery under normal mill conditions. Lap rejection, causes of lap defects and their remedies. Processing parameters for working different varieties of cotton in blow room.

Blow room accessories, e.g. shirley analyzer. Lap meter, varimeter, V-signal moisture indicator etc. Introductory idea about cleaning efficiency and opening efficiency of blow room machinery. Brief outline of setting the blow room line for different man made fibres.

WE 203 Weaving Preparation-I **3/150**

Winding: Process description, objectives, different types of packages, different types of winding machines non-automation, automatic and their mechanism, package drive, traversing mechanism. Stop motion, tensioning devices, yarn clearer. Mechanical and Electronic ribbon formation and its prevention. Principles of different splicing mechanism, classimat, knots/splicing.

Processing control in winding and calculations.
Recent developments in winding.

Warping: Process description, objectives, packages, different types of machines and their mechanisms, study of different type of Creals. Sectional warping machines, modern warping machines, attachment for soft beams for dyeing. Process control in warping an calculations. Recent developments in warping.

Pirn Winding: Objectives, different types of pirn winding machine and their mechanisms. Bunch building mechanism. Recent developments in pirn winding.

WE 205 Fabric Manufacturer-I **3/150**

Introduction to coeaning process.

Loom: Primary, Secondary and Auxiliary motions, their mechanism, settings, theoretical calculations for production and efficiency.

Dobby: Negative and positive dobbies and their mechanism. Staubli and Hafferbley dobbies.

Take up and let-off motions. advantages and disadvantages of negative and positive take-up and let-off motions.

EN 207 Thermal Sciences (Common) **3/150**

Definitions and basic concepts. Units and measurements. Laws of thermodynamics, thermodynamic bahaviour of working substances, circulation of properties in different phases. Analysis of work production cycles. Steam generators and their accessories. Fuels and consumption. Heat transfer (elementary theory, e.g. modes of heat transfer, steady and unsteady heat transfer), simple discussion on the theory of conductivity. Heat exchanges.

Psychrometry systems of humidification in textile industry, air conditioning system, heat lead calculations, operation of plants in textile industry.

EN 209 Electrical Engineering and Electronics (Common) 3/150

Nodal and mesh analysis, network theorems - their statements and applications.

AC circuits, representation of alternating voltage and current by vectors, equations of the alternative currents. Significance of operators, alternating current through resistance, inductance and capacitance, alternating current through different combination of resistance, inductance and capacitance and their vector diagrams.

Transformer (Single phase): Construction and working principle of operation. E.M.F. equation, theory of ideal and actual transformer, vector diagrams of transformer for different leading equivalent circuits, open and short circuit tests, regulation, efficiency, auto transformer.

Three phase induction motor: Principle of operation, torque equation at stands still and under running conditions, torque slip characteristics, starting methods of induction motor its applications in textile industry.

Number of codes, binary and hex numbers, BCD numbers conversion from one to another number.

Invertor OR Gate, AND Gate, NOR gate, NAND gate, Exclusive OR Gate, exclusive NOR Gate. Boolean algebra. S.R. F/F, JK F/F, JK master slave FF, D type and T type F.F. Arithmetic logic units.

Binary addition, binary subtraction, half adders, full adders, binary adders

MA 211 Applied Statistics 3/150

Measures of dispersion, Moments, Skewness and Kurtosis. Basic concepts of probability, Random variables, Discrete and continuous probability distribution, laws of expectations. Main features of binomial, Poisson and normal distribution and their properties. Their application in Engineering and Industrial problems.

Analysis of Correlation and Regression (Only Multiple and partial) and Rank Correlations. Theory of attributes. Sampling theory, Introduction to the theory of Estimation, Test of hypothesis, t, F, X^2 - Test - Simple analysis of variance of one and two way classification. Introduction to experimental design.

EN 213 Electrical Engineering and Electronics Lab (Common) 4/150

Identify the following logic gates: AND, OR, NOT, NAND, NOR, Ex-Or. Perform AND, OR, NOT operations using only (a) Nand gate (b) NOR Gate. Verify the boolean algebraic theorem. Realise the logical expressions. Set up an half adder and full adder circuit and verify their truth table experimentally. Count input pulse using binary counter. Count input pulse using decoder/driver and display.

TT 215 Fibre Microscopy and Identification (Common) 2/150

Principle of microscopy, microscopic identification of fibres, preparation and mounting of specimen for longitudinal view. Cross-section cutting. Microtomy - Cork method, metal plate method. Har's microtom. Mountains and reagents for fibre microscopy. Standard scheme of analysis of homogenous fibre and blends by physical and chemical methods. Qualitative and quantitative determination of components.

Preparation of reagents used for chemical analysis.

SP 217 Spinning Practical-I 4/150

Practice in handling and operation of blowroom. Study of constructional details of machinery: various controls, change place, etc. Practice in checking of the quality of lap. Calculation pertaining to blow-room.

WE 219 Weaving Practical-I 4/150

Study of constructional details of cone winding, pirn winding, warping, slasher sizing, handloom, powerlooms.

Practice in handling and operating cheese, cone and pirn winding machines, handloom and power looms. Calculation operating to winding, warping, sizing and looms.

FOURTH SEMESTER

SP 202 Yarn Manufacture-II **3/150**

Introduction to Roller & Cleaner Card. Objects of carding. Detailed study of revolving flat card. Carding theories. Constructional features and working details of liker-in, cylinder, doffer and flats for processing different cottons. Flexible bands. Card clothing flexible and metallic, stripping, processing parameters for different materials. Carding defects and their remedies. Fibre neps, their assessment and control. Introductory information about modern developments in carding. Control of waste and cleaning in carding.

Objects of drawing. Working principle of draw frame including constitutional details. Systems of drafting, weighing in draw frames. Mechanical and electrical stop-motions. Draft distribution: various types of drafting rollers and their construction. Coiling systems; Over coiling; under coiling and coiling. Concept of ideal draft and formation of drafting waves. Principles of roller setting. Introduction to modern developments in draw frames.

Calculations pertaining to draft and production of the machine dealt with the course.

WE 204 Weaving Preparation-II **3/150**

Sizing objective, ordinary sizing machines, sizing ingredients, Modern sizing machines, Shirley Size box. Factors influences size pick up, moisture stretch and their control.

Common Faults in sizing and remedies.

Size receipes for cotton, rayon, synthetic and blended yarns. Methods of size separations. Calculations pertaining to reduction and efficiency of these machines. Special requirements for processing of synthetic filament and textured yarn. Process control in sizing. Energy considerations, Conservations/recycling, performance evaluation of sized yarn. Recent developments in sizing. Uniformity of ad-on, instrumentation and controls.

WE 206 Fabric Manufacture-II **3/150**

Multiple boxmotion. Non-skip and Skip type box motion. Pick and pick looms. Preparation of pattern chain pertaining to above dobbies and multibox motions.

Automatic Looms/Weft replenishment mechanism. Thread cutter mechanism/automatic looms with multiple boxes. Mechanism of different Jacquard machines. Harness Tyeing. Recent development in Jacquard. Calculation pertaining to above machines. Electronic shuttle monitoring.

WE 208 Fabric Structure-II **3/150**

Classification of fabrics, plain weave and derivatives, ornamentation, Twill weave and derivatives, ornamentation, effect of twist on prominency of twill lines. Sateens & strains, their extensions. Crepe weave, diamond, meckleno, cork-screw, honey comb, huck-a-back, badford cards, weft and pique fabrics.

Draft, pegplan, etc. for above and particulars of common varieties of these fabrics.

EN 210 Micro-Processor Technology (Common) **3/150**

Introduction to micro-processors. Introduction to digital system design. Microprocessor architecture, basic blocks, stored programme concept, machine instructions and their formats, programme counter, accumulator, general purpose register, stack and subroutines, buses, data, address and control instruction cycles and machine cycles.

8085 Microprocessor Memories

ROMS, PROMS, EPROMS, RAMS, a small TTL, memory, Hexadecimal address, assembly level language, addressing modes, programming examples. Input/output techniques: programmed I/O Restart Instructions, interrupts, interrupt instructions, serial input, serial output, DMA and vectored interrupts.

Peripheral interfacing; Switching, Keyboards, displays, A/D and D/A converters, printer, cassette recorder, CRT.

Support Chips; the 8156, port number for 8156, programming the Timer. The 8355, fully decoded. Minimum system, creating and addressing new I/O ports. Expanding the memory with static RAM.

GT 212 Apparel Industry - An Introduction **3/150**

Present status of Apparel Industry - Organisational Chart, Distribution Channels, Quota System.

Elements of fashion - Fashion terms, fashion cycle, principle of fashion, factors influencing fashion.

Garment manufacturing technology - Marker making, Spreading, Cutting, Making-up, grading, fusing.

EN 214 Machine Drawing (Common) 4/150

Technical terminology and drawing conventions. Example from IS 696 of 1960 for conventional representation of springs, gears, screws, bearings, etc. Preparation of production drawings for mechanical developments and assemblies. Detailing from assembly and assembly drawings from details. Exercises in sketching from actual models, Cams and tappets construction.

EN 216 Microprocessor Lab (Common) 4/150

Preliminary Experiments (PE), Elementary Programming Exercises (EPE). Input Output Experiments (IOE). Project Demonstration (P.D.).

SP 218 Spinning Practical-II 4/150

Familiarity with carding machine, constructional details, change places, Effect of various machine parameters in production and quality of sliver. Checking the quality of sliver. Calculation pertaining to Card. Card dropping and wastes and their analysis including cleaning efficiency. Practice in checking the quality of lap; and sliver, methods of rectifying defects therein. Calculation pertaining to card gearing.

WE 220 Weaving Practical-II 4/150

Study of winding tension, Slub catcher and guage levels, practice in cleaning the quality of winding packages and methods of rectifying the defects. Study of secondary and auxiliary loom motions and their timings. Calculation pertaining to the winding and various motions of the loom.

B.TECH (TEXTILE TECHNOLOGY)
SCHEME OF STUDIES

FIFTH SEMESTER

SUBJECTS

Index No.	Theory Papers	Hours Per Week
SP 301	Yarn Manufacture-III	3
WE 303	Fabric Manufacture-III	3
WE 305	Fabric Structure-II	3
FS 307	Polymers & Extrusion OR	3
GT 307	Apparel Production & Quality Control	
MS 309	Business Environment & Marketing Management (common)	3
TT 311	Textile Testing-I (common)	3
		18
	Practicals	
WE 313	Fabric Analysis	4
CS 315	Computer Packages Lab (common)	4
TT 317	Textile Testing Practical-I (common)	4
SP 319	Spinning Practical-I	4
WE 321	Weaving Practical-I	4
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SIXTH SEMESTER

SP 302	Yarn Manufacture-III	3
TT 304	Textile Chemical Processing	3
TT 306	Structure & Properties of Fibres OR	3
GT 306	Apparel Production & Quality Control-II (common)	
FS 308	Man-Made Fibre Production	3

TT 310	Mechanics of Textile Machinery	3
TT 312	Textile Testing-II (common)	3
		18
	PRACTICALS	
TT 314	Textile Testing Practical-I (common)	4
TT 316	Textile Chemistry Practical	4
SP 318	Spinning Practical-II	4
WE 320	Weaving Practical-II	4
		34

Mill Practice: At the end of B.Tech Sixth Semester course each student would undergo atleast Six weeks Practical Training in a Textile Mill/Laboratory with the approval of the Director, TITS and submit a hand written/typed report which would be evaluated by a Board of examiners. The examination in the subject of Mill Practice would be held alongwith the examination of B.Tech (Seventh Semester).

B.TECH (TEXTILE TECHNOLOGY) SCHEME OF EXAMINATION

FIFTH & SIXTH SEMESTER

SUBJECTS

Index No.	Theory papers	No. of papers	Time (hrs.)	Marks of paper	Marks of C/work	Total Marks
SP 301	Yarn Manufacture-III	1	3	100	50	150
WE 303	Fabric Manufacture-III	1	3	100	50	150
WE 305	Fabric Structure-II	1	3	100	50	150
FS 307	Polymers & Extrusion (common) OR	1	3	100	50	150
GT 307	Apparel Production & Quality Control-I (common)	1	3	100	50	150

MS 309	Business Environment & Marketing Management (common)	1	3	100	50	150
TT 311	Textile Testing-I (common)	1	3	100	50	150
SP 302	Yarn Manufacture-IV	1	3	100	50	150
TT 304	Textile Chemical Processing	1	3	100	50	150
TT 306	Structure & Properties of Fibres	1	3	100	50	150
	OR					
GT 306	Apparel Production & Quality Control-II	1	3	100	50	150
FS 308	Man-Made Fibre Production (common)	1	3	100	50	150
TT 310	Mechanics of Textile Machinery	1	3	100	50	150
TT312	Textile Testing-II	1	3	100	50	150
	PRACTICALS					
WE 313	Fabric Analysis	1	4	100	50	150
CP 315	Computer Packages Lab (common)	1	4	100	50	150
TT 317	Textile Testing Practical-I (common)	1	4	100	50	150
SP 319	Spinning Practical-I	1	4	100	50	150
WE 321	Weaving Practical-I	1	4	100	50	150
TT 314	Textile Testing Practical-II (common)	1	4	100	50	150
TT 316	Textile Chemistry Practical	1	4	100	50	150
SP 318	Spinning Practical-II	1	4	100	50	150
WE 320	Weaving Practical-II	1	4	100	50	150

Mill Practice: At the end of Sixth Semester course each student would undergo atleast Six weeks practical training in a Textile Mill/Laboratory with the approval of the Director, TITS and submit a written/typed report which would be evaluated by a Board of Examiners. The examination in the subject of Mill Practice will be held alongwith the examination of B.Tech Seventh Semester.

SYLLABUS FOR B.TECH (TEXTILE TECHNOLOGY)

FIFTH SEMESTER

SP 301 Yarn Manufacture-III **3/150**

Objects of combing. Systems of lap preparation. Study of sliver lap, ribbon lap and super lap machines. Configuration of fibre feed and its effect on the quality of product, noil percentage and fractionation efficiency of comber, Types of combers. Detailed study of the Nasmith type comber. Timing and setting of Comber for different classes of cotton. Control of comber wastes. Calculations pertaining to draft, production and noil percentage. Introduction to the recent developments in combing.

Objects of speed frame. Conventional and modern roving processes. Mechanisms involved in drafting, twisting and winding. Basic principles of designing of cone drums. Differential motions and their working principles. Building motions, their objects and types, working principle of English type builder motions. Drafting systems (ordinary and high draft).

Processing parameters for different hank rovings. Common defects in roving packages, their causes and remedies.

Calculations pertaining to gearing, constants, drafts, tpi and production. Twist multiplier ier and roving twist.

Introduction to the changes to be made on roving frame to run man-made fibre.

WE 303 Fabric Manufacture-III **3/150**

Definition of knitted structure, general description of knitting machines, products and uses.

Basic knitting action (beard, latch and compound needle knitting with sinkers) for knitted structures. Rib and inter-lock structures and machines for producing these structures. Simple dial, cylinder, flat bed super-imposed cylinder and purl machines. Methods of producing knitted underwear, outwear garments, hose and half hose. Fabric geometry of knitted structure, Quality control of knitted fabrics, Factors affecting fabric dimensions and quality.

Introduction of non-woven fabrics, Classification and fields of application. Methods of web preparation and production of various types of non-woven fabrics.

WE 305 Fabric Structure-II **3/150**

Extra Warp & Weft figuring, Baked cloths, Double cloths, Treble and multilayer clothes, Damask, Brocades, Terry pile structure, Warp Pile, Weft Pile Fabrics, Cloth setting theories, Draft, Peg Plag for above design and particulars of common varieties of these fabrics.

FS 307 Polymers & Extrusion (common) **3/150**

Concept of micro-structure of chain molecules, basic determinants of polymer, Molecular weight measurement and control during polymerisation, molecular weight distribution and its importance in extrudability and stretchability. Fibrous polymers.

Principle of extrusion: Melt, dry and wet extrusion techniques - Design and engineering of equipment, variables and their controls. Post extrusion Process: Stretching, heat setting, twisting, winding/coning, etc. Fibre line process for staple manufacturing.

Characteristics of as-spun filaments, their storing conditions.

Surface activity and fibre finishes and their applications.

GT 307 Apparel Production & Quality Control-I **3/150**

Cutting: The planning, Drawing and reproduction of the marker, the spreading of the fabric to form a lay, the cutting of the fabric.

Sewing: The properties of Seams, Seam types, Stitch types, Sewing m/c feed mechanism, Sewing machine needles, Sewing threads, Sewing problems.

Sewing machinery: basic Sewing machines and associated work aids.

The use of components and trimmings: Labels & Motifs, Linings, Interlinking, Waddings.

Alternative methods of joining materials: Fusing, Welding & Adhensives, Mouldings.

Pressing: The principle of pressing, Pressing equipment and methods.

MS 309 Business Environment and Marketing Management 3/150

Business: Changing concept and objective of Business, professionalisation; Business Ethics: Social Responsibility of Business Responsibility to Shareholders, Employers, Consumers, and to the Community, The Indian situation.

Environment: Meaning of Environment, Constituents of Business Environment; Economic, Social, Political, Legal and Technological Environment; Relation between Firm and Its Environments.

Management: Definition; Theory's Principles of Scientific Management; Henry Fayol's Principles of Management; and Human Relations Approach; Functions of Management (i) Planning, (ii) Organizing, (iii) Staffing, (iv) Directing, (v) Controlling. Forms of Organisation Structures. Line Organisation; Functional Organisation, Line and Staff Organisation, their Merits and Demerits.

The Marketing Process; Mean components, Factors influencing marketing process: Modern Marketing Process.

The Market Concept: Features/Premises of Modern Marketing concept, Marketing Management: Meaning and Importance: Marketing Mix - A very brief description of Product Mix, Price Mix, Distribution Mix, and Promotion Mix.

TT 311 Textile Testing-I (common) 3/150

Introduction to textile testing-aim and scope.

Sampling techniques: General requirements, squaring, Cut squaring and zoning methods for sampling of raw material. Sampling techniques fore yarn and fabrics fort specific tests. Routing sampling techniques used in the textile industry.

Hygrometry and moisture relations of textiles: Terms and definitions, relation between r.h. and regain of textile materials; equilibrium regain, hysteresis. Measurement regain - Principle and operation of equipment. Official regain and concept of current invoice weight.

Measurement of physical characteristics, viz. length, fineness maturity and foreign matter of cotton and other fibres, including principle, construction, operation and calibration of the Equipment in common use. Grading of different cottons.

Nep testing of cotton.

Fibre friction: Theories and measurement of friction of single and fibre assemblies during drafting.

Yarn numbering systems, conversion methods, Measurement of yarn number. Measurement of twist in spun and continuous a filament and ply yarns.

Evenness testing of yarns. Nature and causes of irregularities, principles and methods of evenness testing: evaluation and interpretation of evenness measurements, length variance curves and their associated equipment.

WE ~~315~~ 313 Fabric Analysis **4/150**

Basic principles of woven fabric analysis and estimation of Data for cloth reproduction. Recognition of fabric and yarns and materials used in their construction, Weave analysis, sett, cover factor count and weight calculations for simple and compound woven structures. Specifications for standard woven fabric.

CS 315 Computer Packages Lab (common) **4/150**

Use of packages for Word Processing, Data Base Management System, Spread-Sheet, Graphics, etc.

TT 317 Textile Testing Practical-I **4/150**

Measurement of fibre length and its distribution, fineness, maturity, moisture content and strength etc. using different methods and instruments. Fibre diameter and its variability, cleanliness of cotton, Testing of Neps in Card web, sliver, roving and yarns. Analysis and interpretation of test results.

Measurement of Hank of Sliver Roving and count of yarn and their variability. Single yarn strength and elongation; Lea Strength measurement. Use of statistical techniques for evaluation of experimental results.

SP 319 Spinning Practicals-I **4/150**

Practice in handling, operation, setting and gauging drawframe. Lap former and comber. Study of constructional details of machines: Various controls, change places, etc. Practice in checking the quality of comber lap, sliver and waste analysis; common faults and remedies. Calculations pertaining to gearing: speeds, constants, drafts and production, etc.

WE 321 Weaving Practical-I **4/150**

Practice in handling and operating beam and sectional warping machine and slasher sizing machine. Practice in drawing in of warp threads.

Practice in handling and operating loom fitted with dobby, Jacquard, Drop-box and automatic looms. Calculations pertaining to above mentioned machines.

SEVENTH SEMESTER

SP 302 Yarn Manufacture-II **3/150**

Objects of ring frame, principles and mechanism involved in drafting, twisting and winding. Ordinary and high draft systems.

Yarn twist: terminology, twist levels, concept of twist multiplier, propagation of twist, yarn contraction due to twisting.

Types build. Builder motions (warp, filling and combined common package sizes). Limitations to large package spinning.

Types of rings and travelers and their common uses. Rising and falling lapcats. Balloon control rings, living rings.

Systems of waste collection at ring frame and types of spinning wastes. Limitations in ring spinning and factors responsible for loss in efficiency.

Yarn faults and their remedies. Introduction to the recent development in ring spinning.

Calculations pertaining to gearing, constants, drafts and production of ring frames. Concepts of average mill count and 20's conversion.

Reasons and remedies of end breaks on ring frame. Changes to be done in ring frame to run man-made fibre yarns.

Objects of doubling. System of doubling (dry and wet). Study of Ring Doubler. Two for One Twister. Reasons and Remedies of end breaks on Doubling Frame. Calculations pertaining to gearing constants and prediction.

Fancy yarns: Objects and production of fancy yarns; ply cable and core spun yarns. Sewing threads and tyre cords.

Objects of yarn reeling and doubling. Types of reeling, construction and working of reel. Yarn Bundling.

TT 304 Textile Chemical Processing 3/150

Introduction to various wet processing treatments such as desizing, scouring bleaching and mercerising.

Dyeing of natural and man-made fibres with different dyes. Packing of textile fabrics.

Finishing of natural and man-made fibre fabrics. Finishing materials - their functions and applications. Permanent and semi-permanent finishes like wash-n-wear, crease resistant, anti-shrink, water repellent, organic finishes. Trubenising, Creepung, fabric coating and rot and mildew proofing.

Setting of synthetic fabrics by dry heat and steam and its effect on physical and chemical properties.

Introduction to finishing machines such as suctioners, manglex, drying ranges, hot air dryers, stenters, calenders, raising, milling, plaiting and pressing machines.

TT 306 Structure and properties of Fibres 3/150

Structure of fibres: Morphology and order in fibre structure. Theories of fine structures of fibres.

Study of fibres, study by X-rays - rays, IR spectroscopy optical and electron microscopy. Determination of degree of crystallimity, orientation and crystal size.

Theories of mechanical properties of fibres: Phenomenological approach-stress-strain, creep and relaxation behaviour of simple models, applications of Eyring's model to predict mechanical response of fibres (only the interpretation of equation, no derivation). Integral approach and interpretation of mechanical properties of fibres from their structures. Effect of Crystallinity and orientation on mechanical properties of fibres.

Molecular motions and transition phenomenon. First order and second order transition. Effect of transition and modulus and strength of fibres. Concept of heat setting and pleating.

Properties depending on the amorphous regions, viz. moisture, regain, heat of scorption and swelling etc.

Optical, thermal and electrical properties of fibres.

GT 306 Apparel Production & Quality Control-II 3/150

Production Technology - Manual System, Progressive bundle systems, Process system, Straight line system. Unit production system, Quick response system.

Production Planning Management - Pre-production planning and control, Production planning & control, Material management in clothing production, Operation management.

Quick response in apparel manufacturing.

Quality control - Principles of quality control, Total quality control, Just in time.

FS 308 Man-Made Fibre Production (common) 3/150

Growth and Production of MMF in the world and India, Range of properties required to suit as textile fibre.

Fibre and multifilament yarn manufacturing processes and controls and testing of products at every stage of production of generated cellulosic and protein fibres, synthetic and inorganic fibres, stretching, winding and plying. Physical and chemical properties of MMF and their applications.

TT 310 Mechanics of Textile Machinery 3/150

Designing of cone drums for scutchewrs and speed frames, Roller weighing at different stages of spinning. Inertia of a carding machine. Epicyllic wheel trains used in textile machinery. Differential motion used in textile industry. Differential motion used in speed frames.

The physics and theory of spinning balcony. Yarn tension in ring spinning.

Power requirements for operating various motions and for machines as a whole, at various stages of spinning.

Mechanics of winding and tension variations in winding. Mechanics of various mechanisms of weaving machines.

Simple, compound, and modified harmonic motion. Balancing of rotating machinery. Design of cam and tappet profile for textile machinery.

Velocity of shuttle during acceleration and retardation. Risking force, kinematics of slay and the study of slay eccentricity. Warp tension and its measurement. Power requirement for operation of various motions and for machines as a whole, at various stages of weaving.

TT 312 Textile Testing-II (common) 3/150

Mechanical behaviour of textiles. Terms and definitions, expressing the results, quantities and units.

Introduction to visco-elasticity, creep and relaxation phenomenon, mechanical conditioning and recovery properties of textile.

Experimental methods: Principle of CRL, CRT and CRE type tensile testing machines - various instruments, factors affecting the results of tensile experiments. Evaluation and interpretation of tensile test results. Tension winding test for yarns.

Methods of tests for fabric dimensions and other physical properties; thickness, weight, crimp, shrinkage, air permeability, wettability, shower-proofness, water-proofness and flame-resistance.

Fabric Strength Testing: Tensile, tearing and bursting strength tests; principles and operation of equipment, Fabric bending, shearing and drapping properties: terminology, quantities and units. Experimental method.

Serviceability, wear and abrasion: Definitions, methods for measuring abrasion resistance and revaluation of results. Fabric creasing and crease recovery testing.

TT 314: Textile Testing Practical-II 4/150

Use of Microscopes for testing of yarns for appearance, twist and diameter. Measurement of evenness by conventional and modern testing instruments. Interpretation of results and construction of X & R charts.

Fabric testing for dimensions, construction, weight, thickness, crimp, cover, shrinkage and air permeability.

Fabric testing for load, elongation, tensile, bursting and tearing strength, Abrasion, flexural rigidity, crease-recovery and draping qualities of fabrics.

TT 316: Textile Chemistry Practical 4/150

Pre-treatments such as desizing, scouring and bleaching. Dyeing of cotton, rayon, wool and synthetic fibres with different dyes, e.g. direct, reactive, vat, acid and disperse. Printing of cotton fabrics. Application of finishing agents such as starches, resins, etc.

SP 318: Spinning Practical-II **4/150**

Practice in handling, operating, setting and gauging speed frame, ring frame and doubling frame. Study of constructional details of machinery: various controls, change place, etc. Practice in checking the quality of sliver roving and yarn, common yarn faults and their remedies. Calculations pertaining to gearing: speeds, constants, drafts, tpi and production etc.

WE 320: Weaving Practical-II **4/150**

Setting, timing and tuning of loom-mechanism and various attachments, viz. dobby, jacquard and drop-box.

Practice in checking the quality of warp beams, sized beams and drawn weaver's beam and methods of rectifying the defects. Practice in handling and operating warp and weft knitting machine and calculations pertaining to knitting.

B.TECH (TEXTILE TECHNOLOGY)
SCHEME OF STUDIES

SEVENTH SEMESTER
EFFECTIVE FROM 1996-97 SESSION

SUBJECTS

Index No.	Theory Papers	Hours Per Week
TT 401	Engg. of Textile Structure-I	3
SP 403	Spinning Technology-I	3
WE 405	Modern Method of Fabric Production	3
FS 407	Development in Fibre Production OR	3
GT 407	Advances in Garment Production & Processing	3
SP 409	Multifibre Spinning	3
TT 411	Industrial Engg. & Quality Control (common)	3
	PRACTICALS	
	Seminar	4
	Project Work	8

	Any one of the following Groups	
Group A		
SP 415	Practice of Yarn Production & Control-I	4
WE 417	Practice of Fabric Production & Control-I	4
Group B		
SP 415	Practice of Yarn Production & Control-I	4
FS 419	Practice of Fibre Production and Control	4
Group C		
GT 421	Pattern Cutting & Making up-I	4
WE 417	Practice of Fabric Production & Control-I	4
	(Only for students opting Garment subjects)	----- 38

EIGHTH SEMESTER

TT 402	Engg. of Textile Structure-II (common)	3
FS 404	Textured Yarn Technology (common) OR	3
GT 404	Garment Merchandising & Marketing (common)	3
MS 406	Finance, Material & Human Resource Management	3
TT 408	Mill Organisation & Economics of Textile Processes	3
SP 410	Modern Methods of Yarn Production	3
	Any one of the following Electives	
SP 412	Spinning Technology-II	3
WE 412	Complex Textiles	3
		----- 18
	PRACTICALS	
TT 414	Seminar	4
TT 416	Project Work	8

	Any one of the following Groups	
Group A		
SP 418	Practice of Yarn Production & Control-II	4
WE 420	Practice of Fabric Production & Control-II	4
Group B		
SP 418	Practice of Yarn Production & Control-II	4
FS 422	Practice of Fabric Production & Control-II	4
Group C		
GT 424	Pattern cutting & making up-II	4
WE 420	Practice of Fabric Production & Control-II	4
	(Only for student opting Garment subjects)	---- 38

B.TECH (TEXTILE TECHNOLOGY) SCHEME OF EXAMINATION

SEVENTH & EIGHTH SEMESTER

SUBJECTS

Index No.	Theory Papers	No. of Papers	Time (hrs.)	Marks of Paper	Marks of C/work	Total Marks
TT 401	Engg. of Textile Structure-I (common)	1	3	100	50	150
SP 403	Spinning Technology-I	1	3	100	50	150
WE 405	Modern Methods of Fabric Production	1	3	100	50	150
FS 407	Development in Fibre Production OR	1	3	100	50	150
GT 407	Advances in Garment Production & Processing (Common)	1	3	100	50	150
SP 409	Multifibre Spinning	1	3	100	50	150

TT 411	Industrial Engg. & Quality Control (common)	1	3	100	50	150
TT 402	Engg. of Textile Structure-II (common)	1	3	100	50	150
FS 404	Textured Yar n Technology (common) OR	1	3	100	50	150
GT 404	Garment Merchandising & Marketing	1	3	100	50	150
MS 406	Finance, Material & Human Resource Management	1	3	100	50	150
TT 408	Mill Organisation & Economics of Textile Processes	1	3	100	50	150
SP 410	Modern Methods of Yarn Production	1	3	100	50	150
	Any one of the following Electives					
SP 412	Spinning Technology-II	1	3	100	50	150
	OR					
WE 412	Complex Textiles	1	3	100	50	150
	PRACTICALS					
TT 413	Mill Practice	1	Viva-Voce	200	100	300
	Any one of the following groups					
Group A						
SP 415	Practice of Yarn Production & Control-I	1	4	100	50	150
WE 417	Practice of Fabric Production and Control-I	1	4	100	50	150
Group B						
SP 415	Practice of Yarn Production & Control-I	1	4	100	50	150
FS 419	Practice of Fibre Production and Control-I	1	4	100	50	150

Group C						
GT 421	Pattern Cutting & Making up-I	1	4	100	50	150
WE 417	Practice of Fabric Production & Control-I	1	4	100	50	150
	(Only for Students opting Garment subjects)					
TT 414	Seminar	1	Viva-Voce	100	200	300
TT 416	Project work	1	Viva-Voce	200	100	300
	Any one of the following Groups					
Group A						
SP 418	Practice of Yarn Production & Control-II	1	4	100	50	150
WE 420	Practice of Fabric Production and Control-II	1	4	100	50	150
Group B						
SP 418	Practice of Yarn Production & Control-II	1	4	100	50	150
FS 422	Practice of Fibre Production and Control-II	1	4	100	50	150
Group C						
GT 424	Pattern Cutting & Making up-II	1	4	100	50	150
WE 420	Practice of Fabric Production & Control-II	1	4	100	50	150
	(Only for Students opting Garment subjects)					

SYLLABUS FOR B.TECH (TEXTILE TECHNOLOGY)

SEVENTH SEMESTER

TT 401 Engineering of Textile Structure-I (common) 3/150

Yarn geometry - idealised yarn geometry relationship of yarn number and twist factor. Packing of fibres in yarn. Ideal packing,

hexagonal close packing and other forms, packing factor and its measurement. Yarn diameter, methods of measurement of twist contraction, limit of twist.

Fibre Migration - mechanism of migration, condition for migration to occur, frequency of migration, migration in blended yarns.

Translation of fibre properties into yarn properties, extension of continuous filament yarn for small strians and large strains; prediction of breakages. Mechanics of staple fibre yarns, theoretical and experimental studies. Mechanics of blended yarns; Hambureger model and later modifications. Spinnability of textile fibres-relation with end-breakage rate. Dynamic, bending and torsional behaviour of fibres and yarns.

SP 403 Spinning Technology-I **3/150**

Measurement of performance of blowroom: opening efficiency, cleaning efficiency, lap regularity and waste preparations.

Assessment of performance of card. Study of hooks formation, their control, removal and effect of yarn quality.

Improvements in technology of carding for increased production and improved quality of sliver. High speed card designs of carding machines for improved performance. Shirley pressure point system.

Recent developments in drawing, lap preparation, combing processes, speed frame and ring frame. Types and basic principle of autolevellers.

Baloon geometry in ring spinning. Studies on control of yarn tension on high speed ring spinning frames.

WE 405 Modern Methods of Fabric Production **3/150**

Mechanical principles of the Sulzar weaving Machine - picking, beating-up, selvedge formation and shuttle-less weaving with more than one weft. Air-jet weft insertion with special reference to the Maxbo loom - essential requirements, shedding, weft-measuring, weft-tensioning beating-up, weft gripping, weft cutting, weft-stop motion and selvedge formation.

Weft insertion by water-jet, General description of the water-jet loom: weft supply system, tension measuring device operation of the weft-supply steam, considerations in the system. Fundamental problems of hydraulic weft-insertion. The Rapier systems of weft insertion-weft control

mechanism, special features of weft control system, general timing, system, beating-up, cloth take-up motion. Bobbin-loader and unifil loom winder attachments. Multi phase weaving and Triaxial Weaving.

FS 407: Developments to Fibre Production 3/150

Problems and difficulties associated with the conventional fibres. Modification of fibres at polymerisation and extrusion stages; Grafting with simple chemicals.

Developments in 'Fibre Line' of synthetic fibres. High speed extrusion of synthetic fibre forming polymers. Development and characteristics of LOY, MOY, POY materials. Merits and limitations of these processes.

New Fibres - High Temperature resistant fibres, high performance fibres, poly blends, carbon fibres produced from various precursors. Multifilament profile yarns: Hallow, lebal and multifacial sectional fibres. Fibres used for Geo-textile materials.

GT 407 Advances in Garment Production and Processing 3/150

Automation in Garment Industry-Information Technology in Garment Industry, Microprocessor based machinery in design, pattern making, market making, cutting, sewing, embroidery, programmable machines.

Garment Processing - Garment Dyeing machinery, Dyeing and processing of cotton garments, Polyster, Woollen, Acrylic and blended garments, Garment wash technique, Stone-wash, Enzymatic stone wash, stain removal.

SP: 409 Multifibre-Spinning 3/150

Survey of established practices for the spinning of man-made fibres using different spinning systems with emphasis on fibre and yarn properties and involving enginnering principles. Blending techniques for various man-made and natural fibres problems in Blending. Detailed study of the cotton system process for spinning of man-made fibres and fibre assemblies.

Blended yarn properties and fabric performance.

Cotton Waste: Types, classification and end-uses. Study of machines and methods employed in the production of waste yarns (coiled system and condenser system).

Spinning of wool (Woollen and worsted systems).

Introduction to jute spinning process.

TT 411 Industrial Engineering & Quality Control (Common) 3/150

Building and Environmental Conditions:

Types of building, plant layout, materials handling, lighting and atmospheric conditions. Familiarity with common systems of humidification. Noise and vibration control. Accidents and its prevention.

Machinery Maintenance:

Depreciation, replacement studies, sequencing, waiting lines, machine interference. Machinery maintenance: preventive maintenance, break-down maintenance and planned maintenance. Machine Audit, Modernisation of textile industry.

Work Study:

Work Measurement: Standardization of work elements, predetermined elemental time standards, method of time measurement. Work sampling. Acceptance sampling. Use of snap study and continuous method. Application of time study in a textile mill.

Resource allocation and Scheduling: Techniques of operation research. Allocation problem in a textile mill and its techniques.

Importance of linear programming

PERT and CPM. Network applications in project planning. Calculation of Project work. Use of Computer and its applications.

Quality Control:

Economics of quality control, organisation for quality, S.Q.C. & inspection. Use of control charts in textile mills. Research & development - a case study.

TT 413 Mill Practice 6 weeks (300)

Each student, individual or in association with some other students at the end of Third B.Tech course will observe and collect the general and technical informations pertaining to machinery, raw materials used, yarns and fabrics produced by the textile mills, in which he/she/they are undertaking 6 week's practical training with the approval of the Director, TITS.

Each student will have to submit a written/typed report duly approved and signed by the guide to the Head of the Department.

SP 415 Practice of Yarn Production & Control-I 3/150

Familiarity with established processing parameters for producing carded, combed, blended, folded and fancy yarns.

Case studies pertaining to waste analysis, estimation of the total productivity, actual efficiency levels and causes of loss of efficiency in different spinning preparatory departments, viz. blow-room, card, comber, draw-frame and simplex. Study of blow-room and card performance. Neps count in card web. Checking of comber waste.

Assessment and control of variability before yarn formation. Practice in handling and setting of the various spinning preparatory machines. Workload measurements in spinning preparatory. Oiling and maintenance schedules. Idea of time and motion study.

WE 417 Practice of Fabric Production & Control-I 3/150

Study of constructional details of high speed winding, warping, Sizing machine controls, dobbies, Jacquard, drop-box, automatic looms and knitting machines.

Practice in wearing and knitting and checking the quality of fancy fabric and method of rectifying the defect. Work load assignments in different department.

Familiarity with established processing parameters for weaving and knitting plain and fancy fabrics. Snap Studies.

FS 419 Practice of Fibre Production & Control-I 3/150

Identification, characterisation and testing of Monomers used in fibre production. Purification and purity test on monomers.

GT 421 Pattern Cutting & Making-up-I 3/150

Introduction to methods of pattern making: Tailoring, Flat Pattern & Draping.

Measurement taking & Basic Block Construction: Tools & Materials used in Pattern Making. Cross marks & notches, Seam allowances, Dart placements & identification, Principles of Da

manipulation, Combing & Shifting darts, Tuck darts, Pleats, Flares, Gathers. Style lines, Added fullness, Skirts, Sleeves, Pattern making details, collars, Buttons, Button-holes & facing Placket & Pockets.

Draping & Grading.

EIGHTH SEMESTER

TT 402 Engineering of Textile Structures-II (Common) 3/150

Elements of fabric geometry, cloth setting theories. Fabric cover peirce's concept of fabric geometry-Flexible and elastic thread model, graphical solutions, latest modifications.

Translation of fibre and yarn properties into fabric properties, viz. tensile, tearing, abrasion, bending, shearing, buckling, hysteresis phenomenon etc. Creasing.

Flow through porous textiles, thermal behaviour and comforts of fabrics.

Design of textile structures for certain functional and uses.

FS 404 Textured Yarn Technology (Common) 3/150

Tow conversion processes and direct spinners. Principle of heat and chemical setting of fibres and yarns. Assessment of degree of Set. Material qualifications suitable for texturing. Concept and methods of texturing of multifilament yarns. Design consideration of F.T. machines, their working and controls. Developments in F.T. machines.

Principle of Air-jet texturing, variables and their dependance on yarn quality. Recent advances in Air-jet texturing. Producer texturing during extrusion, Draw-texturing, Spin-draw texturing and techno-economics of the process.

Principles of differential shrinkage; production and properties of acrylic high and low bulk yarns. Chemical texturing of non-thermoplastic yarns.

Slit, split and fibrillated bulk yarns; their properties and uses.

GT 404 Garment Merchandising & Marketing 3/150

Principles of Marketing, Elements of Marketing Mix, Marketing Research.

Product Planning, Pricing, Promotional activities, Channels of distribution in Domestic/Export market in particular reference to textile/garment industry.

Need & rationale of export. Export/Import policy. Impact of multilateral agreement on Textile/Garment Industry.

Dynamics of fashion, Nature of fashion, the elements of fashion merchandising, functions of merchandising, Merchandising Today's fashion.

MS 406 Finance/Materials & Human Resource Management 3/150

Double Entry Book-keeping and Financial Statement; Meaning and Importance of double entry book-keeping, Specimen and purpose of Balance Sheet, Trading and Profit and Loss Account.

Management of Working Capital: Definition; Nature Classification of Working Capital - (i) Permanent working capital, and

(ii) Variables Working Capital; Factors affecting requirment for working capital.

Capital Structure: Meaning: essentials of an ideal/optimum capital Structure; Difference between capital, Capitalisation and Capital Structure.

Source of Finance: A very brief introduction and listing of Internal and External Source of Finance.

Formulation of a project, element of project report.

Personnel Management and HRD.

Job Analysis: Meaning and Importance; Process of Job Analysis; Job Description and Job Specification.

Materials Management: Definition and Objectives: Inventory Management.

Inventory Control: Techniques of Inventory control-ROL, FOR Value Analysis, ABC Analysis, VED Analysis; Factors affecting Inventory Control, Ordering Costs, Carrying Costs, Stock-out Costs, Buffer Stock, Stock Turnover & Lead Time.

TT 408 Mill Organization & Economics of Textile Processes 3/150

Production Planning and machinery balancing.

To acquaint the students with the production rates, waste and efficiency levels of good and progressive textile mills. To determine the number of machines required to produce desired quantities of end products (Yarn and fabric) by taking into consideration the production rates of machines in different departments, efficiency losses and waste levels and important processing parameters like hank, draft, twist multiplier, etc. used at different stages of manufacturing.

Staffing of Departments: Labour allocation in different departments of a textile mill. Work-load standards for card tenters, speed frames and ring tenters, doffers, winders, weavers, etc. in terms of tripartite agreements and labour laws. Process Economics. Economics of large package spinning and short cut processes. Optimum package size. Economics of high production carding and drawing - their cost structures. Process-wise costing including case studies.

Economics of Open-end spinning.

Economics of super-speed automatic warp and weft winding machines. Economics of various labour saving mechanisms mounted on automatic looms like 'box loader' and 'unifil' systems. Economics of Sulzer shuttleless loom, airjet and Water-jet loom.

SP 410 Modern Methods of yarn Production 3/150

Causes leading to advent of unconventional systems of spinning. Classifications of unconventional methods of yarn production. Principles and Engineering design of Rotor Spinning. Effect of Rotor machine variables and fibre properties on the properties of Rotor spun yarn. Limitations of rotor spinning. Study of other open and spinning systems, viz. Electrostatic, Air Vortex and Friction Spinning. Properties and end uses of yarn spun on various open-end spinning systems. Other unconventional systems of spinning viz. Self Twist, Twistless, Faciated, Integrated systems, etc, their working principles, properties and end uses of yarn spun on these systems.

SP 412 Spinning Technology-II 3/150

Irregularities of drafted material: random, quasi-periodic and periodic irregularities, law of addition of irregularities, effect of doubling on irregularity. Causes of irregularity: influence of raw material, process and machine variables on irregularity.

Considerations for evolving a system for process control and its implementation in spinning. Control of mixing quality and cost, waste and cleaning in blow-room and carding, control of comber waste; Yarn quality.

Measurement of productivity of a spinning mill and means to improve it.

Study of short out processes, large package spinning and continuous automatic spinning systems (CAS, NAS, etc).

WE 412 Complex Textiles **3/150**

Special gauge and leno structures. Madras muslin structures. Hand knotted carpets, Ingrain, Wilton, Brussels, Spool-Gripper and Axminster Carpets. Chenile Axminster pile structures and carpets. Tufted carpets. Lappets, Swivels, Ondule Fabrics. Tuck Fabrics, woven pile fabrics produced by thermal shrinkage. Industrial Fabrics. Narrow fabrics. Laces and nets Braids.

TT 414 Seminar

Each student will have to deliver a talk on the topic in the weekly period allotted to this subject, either pertaining to his project work or any topic assigned by Head of the Department.

The performance of the speaker would be judged in the class by a Board of Examiners.

TT 416 Project Work

Each student individually, or in association with some other students will carry out project of an experimental and/or thoeretical nature in one of the main branches of textile technology and present his findings in a systematic manner in the report form duly approved and signed by his Supervisor/Guide (to be nominated by the Head of Department/Institution). Each candidates would submit 3 typed copies of Project Report to the Head of the Department/Institution atleast 15 days before the commencement of Second Semester Examination. One copy of the project report will be returned to the candidate after viva-voce examination. The original Report and a carbon copy will be retained by the concerned Department/Institution and the Supervisor respectively.

SP 418 Practice of Yarn Production and Control-II **3/150**

Collection and interpretation of data for process control and comparing the same with established norms.

Waste analysis in ring and rotor spinning. Locating and improving machines with substandard performance. Case studies pertaining to estimation of the total productivity, actual efficiency levels, causes of loss of efficiency in ring, rotor and air-jet spinning. Study of the defects at various stages of spinning. Assessing process capability for count controls.

Calculation pertaining to comparison of productivity, average count etc. Practice in motion study, time study and work load measurements in ring and rotor spinning departments. Oiling and maintenance schedules. Spare-parts consumption and idea of the life of the various parts.

Practiced in handling and setting of ring and rotor spinning. Assessment and control of variability in ring, rotor and air-jet spun yarns.

Case studies pertaining to yarn costing. Conditions under which a worker is charge-sheeted and suspended. To acquaint with labour laws.

WE 420 Practice of Fabric Production & Control-II 4/150

Case studies pertaining to winding, warping, sizing, drawing in and looming for the estimation of production, efficiency and causes of less in efficiency, excessive wastes, warp and weft breakages, costing rate fixing for new product, damage etc. and to compare the same with established norms.

Familiarity with the temperature and humidity in different department and methods of controlling the same. Oiling and maintenance schedules. Spare-parts consumption and idea of the life of various spare parts. Conditions under which a worker is being chargesheeted or suspended.

To acquaint with labour laws.

Practice in motion study, time study and work-load measurement. Theory of colour primary, secondary and teritary colours. Complementary colours. Colour in combination. Colour and weave effect. Proportion, rhythm and decorative qualities in textile design. Contrast and harmony in textile and colour. Preparation of pattern for dobby and jacquard looms for textile printing.

FS 422 Practice of Fibre Production & Control-II 4/150

Preparation of fibrous polymers and their characterization. Applicative testing of fibres and filaments.

Preparation of yarn samples of different nature and characteristics with specified applications. Speciality yarns.

GT 424 Pattern Cutting & Making-up-II **4/150**

Practice of pattern making, grading, practice of making garments, e.g. skirts, trousers, Shirts etc. Practice of different types of stitches, seems, Dard manipulation.

Practice of different types of Sewing machine e.g. Lock stitch, Interlock, Overlock, Buttonhole stitching etc

Garment defects and their quality control

Application of various dyes to the garments.

Printing of garments using Resist, Discharge, Wax-resist, Tie and dye, Direct style using pigments, Transfer printing

Application of various finishes, e.g. Starch finish wash-n-wear, water-repellent.

Testing of fastness properties, e.g. Light fastness, Washing Fastness, etc. Colour Matching.

B.TECH (TEXTILE CHEMISTRY)
SCHEME OF STUDIES

THIRD SEMESTER

SUBJECTS

Index No.	Theory Papers	Hours Per Week
TC 201	Advance Physical & Colloid Chemistry	3
TC 203	Chemical Engineering & Stoichiometry	3
TC 205	Introduction to Wet Processing	3
EN 207	Thermal Sciences (common)	3
EN 209	Electrical Engg. & Electronics (common)	3
MA 211	Applied Statistics (common)	3
	PRACTICALS	
EN 213	Electrical Engg. & Electronics (common)	4
TT 215	Fibre Microscopy & Identification (common)	2

TC 217	Textile Manufacturing Practice	4
TC 219	Textile Chemistry Practical	4
EN	Machine Drawing (common)	2
		34

FOURTH SEMESTER

TC 202	Scouring, Bleaching & Mercerising	3
TC 204	Unit Organic Process & Chemistry of Intermediates	3
TC 206	Chemistry of High Polymers	3
TC 208	Chemistry of Fibres	3
EN 210	Microprocessor Technology (common)	3
GT 212	Apparel Industry - An Introduction (common)	3
		18

PRACTICALS

EN 214	Machine Drawing (common)	4
EN 216	Microprocessor Lab (common)	4
TC 218	Analytical Chemistry	4
TC 220	Preparatory Process Lab	4
		34

SECOND B.TECH (TEXTILE CHEMISTRY) SCHEME OF EXAMINATION

THIRD & FOURTH SEMESTER

SUBJECTS

Index No.	Theory Papers	No. of Papers	Time (hrs.)	Marks of Paper	Marks of C/work	Total Marks
TC 201	Advance Physical & Colloid Chemistry	1	3	100	50	150
TC 203	Chemical Engineering & Stoichiometry	1	3	100	50	150

TC 205	Introduction to Wet Processing	1	3	100	50	150
EN 207	Thermal Sciences (common)	1	3	100	50	150
EN 209	Electrical Engg. & Electronics (common)	1	3	100	50	150
MA 211	Applied Statistics (common)	1	3	100	50	150
TC 202	Scouring, Bleaching & Mercerising	1	3	100	50	150
TC 204	Unit Organic Process & Chemistry of Intermediates	1	3	100	50	150
TC 206	Chemistry of High Polymers	1	3	100	50	150
TC 208	Chemistry of Fibres	1	3	100	50	150
EN 210	Microprocessor Technology (common)	1	3	100	50	150
GT 212	Apparel Industry - An Introduction (common)	1	3	100	50	150
	PRACTICALS					
EN 213	Electrical Engg. & Electronics (common)	1	3	100	50	150
TT 215	Fibre Microscopy & Identification (common)	1	4	100	50	150
TC 217	Textile Manufacturing Practice	1	4	100	50	150
EN 214	Machine Drawing (common)	1	4	100	50	150
EN 216	Microprocessor Lab (common)	1	4	100	50	150
TC 218	Analytical Chemistry	1	4	100	50	150
TC 219	Textile Chemistry Practical	1	4	100	50	150
TC 220	Preparatory Process Lab	1	4	100	50	150

B.TECH (TEXTILE CHEMISTRY) SYLLABUS

(THIRD AND FOURTH SEMESTER)

TC 201 Advanced Physical & Colloid Chemistry 3/150

Thermochemistry: Heat changes at constant pressure and constant volume. Theremochemical laws, experimental methods, Kirchoff's equation influence of temperature on heat of reaction.

Chemical Equilibrium: Introduction, chemical equilibrium constant, thermodynamic derivation of law of chemical equilibrium. Vant Hoff equation. Experimental methods. Catalysis.

Kinetics: Kinetics of homogeneous reaction. First and Second order reaction.

Electrochemistry: Phenomena of electrolysis, Faraday's Laws of electrolysis, conductance of electrolytes. Theory of electrolytes, migration of ions, transport number. Simple treatment of c.m.f. of cell. Pits measurement by indicatory and electrometric methods. Control and utility of pH in textile wet processing. Electrochemical theory of corrosion.

Colloid Chemistry: Theoretical properties of colloidal systems interfacial phenomena, practice kinesics, electrical property, viscosity characteristics and studies. The character lyophibic and lyophilic solutions, gels and emulsions developed from above properties.

TC 203 Chemical Engg. & Stoichiometry 3/150

Definition and scope of chemical engineering, Unit operations of chemical engineering, material balance and neuclear units, mole fractions Gas laws, simple calculations based on these laws.

Mechanical separation: Introduction to screens and screen analysis, Types of screening equipment.

Size reduction: Crushing and grinding machinery. Introduction to theory of size reduction, power consumption.

Drying: Classification of dryers, special drying machinery used in textiles, Equilibrium moisture contest, Bound, unbound and free water. Evaporation: Evaporator types and their description, accessories, capacity, heat and material balance, elevation of boiling point.

Distillations: Terms and definitions, vapour-liquid equilibrium, boiling point diagrams, equilibrium distillation and differential distillation, Steam distillation. Simple treatment of fluid flow, heat transfer, heat exchangers, fuels and combustion treatment of water.

Corrosion and matgerial of construction.

Industrial hazards in Chemical industry.

TC 205 Introduction to Wet processing **3/150**

Elementary knowledge of processing department. Natural and adventitious impurities in grey fabrics, cotton, wool, silk and synthetics. Introduction to different processes involved for the above and the machinery used.

General methods of dyeing by important, classes of dyes on natural and man-made fibres, e.g. direct, acid, basic, vat, azoic, sulphur and dispers dyes. Chemicals used in dyeing, introductory knowledge of dyeing machines, colour measurement and fastness properties.

Different methods and styles of printing of natural and synthetic fabrics, machinery involved.

Objects of finishing and application of various types of finishes, elementary knowledge of finishing machinery.

EN 207 Thermal Science (common) **3/150**

EN 209 Electrical Engineering & Electronics (common) **3/150**

EN 211 Applied Statistics (common) **3/150**

EN 213 Electrical Engg. & Electronics Lab (common) **4/150**

TC 215 Fibre Microscopy & Identification (common) **4/150**

TC 217 Textile Manufacturing Practice **4/150**

Discussion and demonstration of the various machines and of manufacturing processes involved in converting fibres to fabric, opening, cleaning, carding, drawing, combing, roving, ring, doubling, winding, warping, sizing, drawing-in-weaving process. Production calculations.

TC 219 Textile Chemistry Practical **4/150**

Scouring and Bleaching of Cotton. Dyeing of cotton, rayon and wool with direct, basic, acid, sulphur, vat and azoic colours and polyester

with disperse dyes. Treatment to improve the fastness to light and washing of direct colours on dyeing. Printing of cotton with reactive, vat and azoic colours. Basic finishes.

TC 202 Scouring/Bleaching & Mercerising 3/150

Impurities in grey fabrics and preparatory sequences required for their removal. Chemistry and technology of desizing scouring and bleaching natural and man-made fibre-fabrics and their blends. Machines used for batchwise & continuous scouring and bleaching. Manufacture and mechanism of bleaching by various bleaching agents such as bleaching powder, sodium hypochlorite, hydrogen peroxoide etc, combined preparatory processes and energy conservation. Economics of preparatory processes. Faults in scouring and bleaching and their prevention. Methods used for determination of degradation during scouring and bleaching. Determination of efficiency of various PP. Whiteness measurement. Surface activity and detergency.

Physical and Chemical aspects of mercerisation. Efficiency of mercerisation. Mercerisation of PC blends. Machines for yarn and fabric mercerisation. Hot mercerisation, Liquid ammonia treatment.

Auxiliaries used in scouring, bleaching and mercerising.

TC 204 Unit Organic Process and Chemistry of Intermediates 3/150

Structural features of organic substances. Resonance and its effects. Reactivity of organic compounds. Definition of unit process and unit operation. Study of following unit organic processes with special reference to reaction, reagents used. Physico-chemical factors involved. One or two methods of texture with flow sheet for each processes.

Nitration; sulphonation, oxidation, reduction, ammonolysis, halogenation, acetylation, diazotization and coupling, asterification, polymerisation. Coal tar products, manufacture of dye intermediates based on above processes.

TC 206 Chemistry of High Polymers 3/150

Terms and definitions. Scope of polymer chemistry, plastics, fibres and rubbers. Basic determinants of polymers. Structure and property correlation. Chemistry of important monomers. Basic concepts of high polymers. Classification of polymerisation reaction - their mechanism and kinetics with special reference to polyesters, polyamides,

phenol-formaldehyde, urea-formaldehyde, poxy resins, anionic, cationic and free radical polymerisation. Co-polymerisation. Physical methods of polymerisation.

Measurement of molecular weight and molecular weight dependent properties. Transition phenomenon, morphology and order in fibre forming polymers, polymer chains. Conformations, Rubber elasticity, Viscoelastic behaviour of polymeric solids. Polymer melt rheology. Processing. Application of polymer to textiles.

TC 208 Chemistry of Fibres **3/150**

Chemical composition and constitution of cellulosic fibres. Chemistry of degradation products of cellulose and their determination. The action of physical conditions and chemicals on cotton. Mercerisation. Perchemantisation. Multicellular vegitable fibres.

Chemical composition and constitution of wool and Chemistry of regenerated man-made fibres. Cuprammonium viscose and polynesic fibres. Preparation of cellulose acetate. Regenerated protein fibres. Alginate yarns.

Chemistry of nylon 66 and other polyamide fibres. Chemistry of polyester and acrylontrile fibres. Polyurethane and vinyl products. Elastomeric fibres.

Effect of heat, radiation and chemicals on important natural and man-made fibres.

EN 210 Microprocessor Technology **3/150**

(Common with TT)

EN 212 Apparel Industry - An Introduction **3/150**

(Common with TT)

EN 214 Machine Drawing **4/150**

(Common with TT)

EN 216 Microprocessor Lab **4/150**

(Common with TT)

TC 218 Analytical Chemistry Practical **4/150**

Use of pH meter. Identification of important intermediates in dyes, e.g. aniline, touldine, nitroanilines beta naphathol, etc. A few estimations

from those intermediates. Determination of copper number, methylene number and carboxyl group in degraded cellulose, determination of barium number. Damage in wool, Analysis of phenol and formaldehyde.

TC 220 Preparatory Process Lab **4/150**

Desizing of cotton by enzymatic and oxidative methods. Scouring by caustic soda boil, Enzymatic and solvent scouring. Bleaching using Sodium hypochlorite and hydrogen peroxide. Two stage and single stage preparatory processes. Evaluation of wetting agents. Determination of ash content of grey and bleached cotton. Estimation of available chlorine in hypochlorite bath and peroxide content in hydrogen peroxide bath. Scouring and bleaching of wool. Deguming and bleaching of silk. Scouring and bleaching of polyester and blends. Mercerisation of cotton by various methods and its evaluation.

Assessment of bleached goods. Whiteness and absorbancy measurement, Tests for differentiating various sizes like starch, CMC, PVA and PVAC. Spot and Stain removal.

B.TECH (TEXTILE ~~TECHNOLOGY~~)
SCHEME OF STUDIES

FIFTH SEMESTER

SUBJECTS

Index No.	Theory Papers	Hours per Week
TC 301	Technology of Dyeing	3
TC 303	Chemistry of Dyes	3
TC 305	Fabric Construction & Design	3
FS 307	Polymers & Extrusion (common) OR	3
GT 307	Apparel Production & Quality Control-I	3
MS 309	Business Environment & Marketing Management (common)	3
TT 311	Textile Testing-I (common)	3
		18

	PRACTICALS	
TC 313	Technical Analysis Lab	4
CS 315	Computer Packages Lab	4
TT 317	Textile Testing Practical-I (common)	4
TC 319	Dyeing Lab-I	4
TC 321	Industrial Wet Processing-I	4
		38

SIXTH SEMESTER

TC 302	Wet Processing of Synthetic & Blended Textiles	3
TC 304	Textile Printing	3
TT 306	Structure & Properties of Fibres (common)	3
	OR	
GT 306	Apparel Production & Quality Control-II	3
FS 308	Man-Made Fibre Production (common)	3
TC 310	Textile Finishing-I	3
TT 312	Textile Testing-II (common)	3
		18
	PRACTICALS	
TT 314	Textile Testing Practical-II (common)	4
TC 316	Dyeing Lab-II	4
TC 318	Printing Lab.	4
TC 320	Finishing Lab.	4
		34

Note: *Examination in subjects with even Index Nos. will be held at the end of the Second Semester.*

Mill Practice: At the end of B.Tech Sixth Semester course each student would undergo atleast Six weeks Practical Training in a Textile Mill/Laboratory with the approval of the Director, TITS and submit a written/typed report which would be evaluated by a Board of examiners. The examination in the subject of Mill Practice would be held alongwith the examination of B.Tech (Seventh Semester).

B.TECH (TEXTILE ~~TECHNOLOGY~~ Chemistry)
SCHEME OF EXAMINATION

FIFTH & SIXTH SEMESTER

SUBJECTS

Index No.	Theory papers	No. of Papers	Time (hrs.)	Marks of Paper	Marks of C/work	Total Marks
TC 301	Technology of Dyeing	1	3	100	50	150
TC 303	Chemistry of Dyes	1	3	100	50	150
TC 305	Fabric Construction & Design	1	3	100	50	150
FS 307	Polymers & Extrusion (common) OR	1	3	100	50	150
GT 307	Apparel Production & Quality Control-I	1	3	100	50	150
MS 309	Business Environment & Marketing Management (common)	1	3	100	50	150
TT 311	Textile Testing-I (common)	1	3	100	50	150
TC 302	Wet Processing of Synthetic & blended textiles	1	3	100	50	150
TC 304	Textile printing	1	3	100	50	150

TT 306	Structure & Properties of Fibres (common)	1	3	100	50	150
	OR					
GT 306	Apparel Production & Quality Control-II Organisation (common)	1	3	100	50	150
FS 308	Man-Made Fibre Production (common)	1	3	100	50	150
TC 310	Textile Finishing-I	1	3	100	50	150
TT 312	Textile Testing-II (common)	1	3	100	50	150
	PRACTICALS					
TC 313	Technical Analysis Lab	1	4	100	50	150
TT 314	Textile Testing Practical-II (common)	1	4	100	50	150
TT 317	Textile Testing Practical-I (common)	1	4	100	50	150
TC 319	Dyeing Lab-I	1	4	100	50	150
TC 316	Dyeing Lab-II	1	4	100	50	150
TC 321	Industrial Wet Processing-I	1	4	100	50	150
TC 318	Printing Lab	1	4	100	50	150
CP 315	Computer Package Lab	1	4	100	50	150
TC 320	Finishing Lab	1	4	100	50	150

						3150

Mill Practice: At the end of B.Tech Sixth Semester course each student would undergo atleast Six weeks practical training in a Textile Mill/Laboratory with the approval of the Director, TITS and submit a

written/typed report which would be evaluated by a Board of Examiners. The examination in the subject of Mill Practice will be held alongwith the examination of B.Tech Seventh Semester.

B.TECH (TEXTILE CHEMISTRY) SCHEME OF STUDIES

FIFTH AND SIXTH SEMESTER

TC 301 Technology of Dyeing **3/150**

The principles and methods of dyeing of cellulosic fibres with Natural, Direct, Azoic, Reactive, Vat, Sulphur, Indigosal dyes, Oxidation colours, mineral khaki, phthalogen blue, alacian blue and pigments. Dyeing of protein fibres with acid, basic, metal complex, mordant and reactive dyes. Dyeing of cotton-wool blend.

Dyeing of knitted goods, compatiability of dyes in mixture, selection of dyestuff based on colour, dyeing properties and fastness requirement. Garment Dyeing.

TC 303 Chemistry of Dyes **3/150**

Historical development of coal dye industry. Classification of dyes according to chemical constitution. Methods of preparation of nitroso, e tazinosm, nitro, azo, pyrazoline, accridina, xanthena, anthrequione, azianes, athianine, indigom thionidigo and various dyes, chemistry of reactive dyes. The relation between colour and constitution. Relation between substantivity and chemical constitution.

TC 305 Fabric Construction & Design **3/150**

Classification of fabrics, Constructional features of various woven fabrics, Methods of ornamenting fabric. Construction of plain, twill and sateen weaves and their derivative, string and check affects by combination of two weaves. Vertical and horizontalware line and diamond effects. Spot figure designs and plain, twill and sateen basis.

FS 307 Polymers & Extrusion **3/150**

(Common with TT) OR

GT 307 Apparel Production & Quality Control-I **3/150**

(Common with TT)

MS 309 Business Environment & Marketing Management **3/150**

(Common with TT)

TT 311 Textile Testing-I **3/150**

(Common with TT)

TC 313 Technical Analysis Lab **3/150**

Identification of dyes and certain intermediates on materials and in substance according to dyeing and chemical constitution. Working of different instruments for fastness properties to light, washing, rubbing etc. Evaluation of change in colour staining. Measurement of viscosity of printing paste, calorific value calculation using bomb calorimeter, Effluent monitoring and testing.

CS 315 Computer Package Lab **3/150**

(Common with TT)

TT 317 Textile Testing Practical-I **3/150**

(Common with TT)

TC 319 Dyeing Lab-I **4/150**

Introduction to experimental dyeing, commercial dye nomenclature and colour index. Effect of salt concentration and M/L ratio on exhaustion of direct dyes. Effect of after treatments on wash fastness of direct dyes. Dyeing of cotton and rayon with various dyes - direct, azoic, reactive and sulphur black, mineral khaki. Effect of various fixation methods for reactive dyeing. Pigment dyeing.

Dyeing of wool and silk with acid, metal complex and mordant dyes. Dyeing with natural dyes. Measurement of light, wash and rubbing fastness of various dyeing. Stripping of dyes from fibres.

TC 321 Industrial Wet Processing-I **3/150**

Singeing, desizing, scouring and bleaching of cotton, bleaching of coloured goods, mercerisation of yarn and cloth. Dyeing of loose fibre, cheese, hanks and fabrics in different machines. Single and multicoloured printing.

TC 302 Wet Processing of Synthetic and blended textiles 3/150

Chemistry and technology of dyeing polyester, nylon and acrylics. Dyeing of important blends of natural and synthetic fibre fabrics. Dyeing of microfibre fabrics. Dyeing machines for dyeing in fibre, yarn and fabric yarns. Mass colouration.

Styles and techniques of printing synthetics and blended textiles. Heat setting and other finishing techniques.

TC 304 Textile Printing 3/150

Methods of printing viz., Block, spray, Stencil, Roller screen and transfer printing. Special effects like Batik, tie and dye etc. Design making and screen exposing. Table, flatbed and Rotary screen printing, Duplex printing.

Composition of printing paste, Printing ingradients and their function. Styles of printing, i.e. direct, discharge and resist. Printing with azoics, vat, solubalized vat, reactive acid, metal complex and disperse dyes. Various discharging and resisting agents. Pigment printing. Transfer printing of cotton and polyester.

Methods of print fixation. Machines used in printing, drying, print fixation and washing.

TT 306 Structure and Properties of Fibres 3/150

(Common with TT) OR

GT 306 Apparel Production & Quality Control-II 3/150

(Common with TT)

FS 308 Man-Made Fibre Production 3/150

(Common with TT)

TC 310 Textile Finishing-I 3/150

Classification of finishes. Mechanical finishes - drying, tentering, damping, conditioning, calendering, sanforizing, softening, heat setting, crabbing, decatising, milling, potting, raising, setting and shrink finishing of wool, etc.

General chemical finishes like stiffening, creping, delustering of rayon, weighting of silk and cotton, organdie finish, etc.

Minimum application techniques, foam finishing, vaccum systems, open-width washers.

TT 312 Textile Testing-II **3/150**

(Common with TT)

TT 314 Textile Testing practical-II **3/150**

(Common with TT)

TC 316 Dyeing Lab-II **4/150**

Characterization of disperse dyes by testing the fineness of dispersion, particle size distribution, levelling and migrational properties. Suction filter test, flow test and dip number test. Plotting the visible spectra and nothing the wavelength of maximum absorption. Effect of carrier concentration on dye uptake of thermosol, HTHP and carrier dyeing. Measurement of rate of dyeing of polyester with disperse dyes.

Acid dyeing of nylon. Effect of various dye fixing and levelling agents. Dyeing of acrylics, effect of retarders. Dyeing of blends in union and cross shades.

TC 318 Printing Lab **4/150**

Cotton printing with reactive dyes - effect of dryheat, steming and pad-patch methods of fixation, effect of various thickeners/additives; Resist and Discharge printing. Printing with azoic colours - base printing; naphtholate printing; Discharge and resist effects. Printing with vat dyes - all-in process and pad steam process. Printing with Indigosols - steaming and nitrite method. Printing with aniline black. White resist under aniline black.

Polyester printing with disperse dyes - fixation by thermosol, HTHP; discharge and resist effects. printing of nylon with acid, reactive and disperse dyes. Printing of acrylic with basic dyes. Printing of polyester cotton blend with disperse reactive dyes.

TC 320 Finishing Lab

Finishing of textiles to obtain different effects, e.g. crease resistance, water repellant, flame retardancy, softening, stiffening, soil release etc. Heat setting and its evaluation. Common finished like soil

finish, poplin finish, saree finish, Bucktum finish, dyed goods finish, printed good finish, organic finish, carbonising and non-felting finishing of wool, etc.

Determination of free formaldehyde and urea. Simultaneous dyeing and finishing.

B.TECH (TEXTILE CHEMISTRY)
SCHEME OF STUDIES

SEVENTH SEMESTER
EFFECTIVE FROM 1996-97 SESSION

SUBJECTS

Index No.	Theory Papers	Hours per Week
TT 401	Engg. of Textile Structure-I (common)	3
TC 403	Wet Processing Machinery	3
TC 405	Textile Chemical Texting	3
FS 407	Development in Fibre Production (common) OR	3
GT 407	Advances in Garment Production & Processing (common)	3
TC 409	Theory of dyeing and Colour Measurement	3
TT 411	Industrial Engg. & Quality Control (common)	3
		18
	PRACTICALS	
	Seminar	2
	Project Work	6
TC 415	Colour Measurement & CCM Lab	4
TC 417	~~Industrial~~ Pilot Wet Processing-II ~~OR~~ Lab	4
GT 421	Pattern Cutting & Making up - I	~~4~~
		34

EIGHTH SEMESTER

	Theory Papers	
TT 402	Engg. of Textile Structure-II (common)	3
FS 404	Textured Yarn Technology (common) OR	3
GT 404	Garment Merchandising & Marketing (common)	3
MS 406	Finance, Material & Human Resource Management (common)	3
TC 408	Textile Auxiliaries & Chemicals	3
TC 410	Textile Finishing-II	3
TC 412	Developments in Textile Chemical Processing	3
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	PRACTICALS	
TC 414	Seminar	2
TC 416	Project Work	6
TC 418	Evaluation of Auxiliaries and Finished Textiles	4
TC 420	Industrial Wet Processing-II OR	4
GT 424	Pattern Cutting & Making up-II	
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SCHEME OF EXAMINATION B.TECH (TEXTILE CHEMISTRY)

SEVENTH & EIGHTH SEMESTER

SUBJECTS

Index No.	Theory Papers	No. of Papers	Time (hrs.)	Marks of Paper	Marks of C/work	Total marks
TT 401	Engg. of Textile Structures-I (common)	1	3	100	50	150

TT 402	Engg. of Textile Structure-II (common)	1	3	100	50	150
TC 403	Wet Processing Machinery	1	3	100	50	150
FS 404	Textured Yarn Technology	1	3	100	50	150
	OR					
GT 404	Garment Merchandising & Marketing					
TC 405	Textile Chemical Testing	1	3	100	50	150
MS 406	Finance, Material & Human Resource Management (common)	1	3	100	50	150
FS 407	Developments in Fibre Production (common)	1	3	100	50	150
	OR					
GT 407	Advances in Garment Production and Processing (common)	1	3	100	50	150
TC 408	Textile Auxiliaries & Chemicals	1	3	100	50	150
TC 409	Theory of dyeing and colour Measurement	1	3	100	50	150
TC 410	Textile Finishing-II	1	3	100	50	150
TT 411	Industrial Engineering and Quality Control	1	3	100	50	150
TC 412	Developments in Textile Chemical Processing	1	3	100	50	150

	PRACTICALS					
TC 413	Mill Practice	1	Viva-Voce	200	100	300
TC 414	Seminar	1	-do-	-	200	200
TC 415	Colour Measurement & CCM Lab	1	-do-	~~200~~ 100	~~100~~ 50	~~300~~ 150
				200	100	300
TC 416	Project Work	1	4	~~100~~	50	~~150~~
TC-417	Pilot Wet Processing Lab	1	4	100	50	150
TC 418	Evaluation of Auxiliaries & Finished Textiles	1	4	100	50	150
TC 420	Industrial Wet Processing-II	1	4	100	50	150
GT 421	Pattern Cutting & Making up-I	1	4	100	50	150
GT 424	Pattern Cutting & Making up-II	1	4	100	50	150

						~~350~~ 350

SYLLABUS FOR B.TECH (TEXTILE CHEMISTRY)

SEVENTH SEMESTER

TT 401 Engineering of Textile Structures-I **3/150**

(Common with TT)

TC 403 Wet Processing Machinery **3/150**

Functional design of colouration machines - Fibre and yarn dyeing machines. Jigger, winches, pressure beam, jet dyeing machine, mangles, open-width washers, hydroextractgors, vaccum/steam impregnators, vaccum extractors, continuous bleachers and steamers, mercerizers, cylinder dryers, stenter, solvent scouring machines, garment dyeing machines, rotary, flat-bed printing machines, calenders.

Fabric transport devices, synchronization of machinery, Instrumentation and process control, boiler plant and electricity supply.

TC 405 Textile Chemical Testing **3/150**

Introduction to textile chemical testing - aim and scope. Quantitative chemical analysis of textile fibres and their blends. Methods of identification of application classes of dyes on textile materials. Quantitative estimation of bleaching agents and dyes. Colour fastness of dyes on textiles. International standards. Estimation of mechanical and chemical degradation of cotton, wool, silk and polyester (aldehyde and carboxy group estimation in cellulosics, amino group estimation of protein fibres, fluidity/viscosity, measurement, critical dissolution time, etc). Evaluation of various chemicals, auxillaries, fuel oil, coal etc. Analysis of fresh waters and effluent. Measurement of viscosity of chemical ingradients, printing paste, fuel oil etc. Instruments used in chemical analysis.

FS 407 Developments in fibre Production **3/150**

OR

GT 407 Advances in Garment Production and Processing **3/150**

(Common with TT)

TC 409 Theory of Dyeing and Colour Measurement **3/150**

Evolution of theories of dyeing. Fundamentals of Kinetics and thermodynamics related to dyeing. Diffusion equations and methods for measurement of diffusion coefficients and activation energy. Diffusion of direct dyes in cellulose, and disperse dyes in polyester. Their relationship with fibre structure. Effect of heat setting. Dye fibre interactions. Thermodynamic parameters like affinity and heat of dyeing. Thermodynamics of dyeing cotton with direct dyes, wool with acid dyes and polyester with disperse dyes. Zeta potential and its importance in dyeing. Glass transition temperature and its influence on Dyeing.

Sources of natural light, sources of artificial light, CIE standard sources, Absorption and scattering of light, Spectrophotometer curves and their relationship to perceived colour. Instrument for the measurement of colour of transparent and opaque objects. Reflectance spectrophotometers and colorimeters, Trichromatic colorimeters, Colorimetry and the CIE system, the 1931 CIE system colour rendering of light sources. The concept of colour space, Munsell colour space, Quantification of colour differences, Setting the pass/fail values, shade sorting, Spectrophotometric curve matching, Colourimetric matching, Reducing cost/metamerism by

computer formulation, Derivation from linearity in receipt prediction equation. Recipe prediction using fluorescent dyes, Recipe correlation, Recipe formulation on fibre blends, Colour measurement of pigmented materials, Calculation of K & S data for optimum pigment loading in translucent materials. Solution of complete match prediction equations.

TT 411 Industrial Engg. & Quality Control **3/150**

(Common with TT)

TC 413 Mill Practice **6 weeks (300)**

Each student individual or in association with some other student at the end of Third B.Tech course will observe and collect the general and technical informations pertaining to machinery, raw material used, yarns and fabrics produced by the textile mill, in which he/she is undertaking 6 weeks practical training with the approval of Director, TITS.

TC 415 Colour Measurement and CCM Lab **4/150**

Absorptiometric colorimetry, principles and working of various instruments for measuring colour in solution form and for measuring reflectance of light from coloured fabrics. Colourimetric determination of substances in mixed solutions. Tests by Beer's law. Use of colour measurement to measure rate of dyeing, affinity, diffusion coefficients, etc.

Computer colour matching. Familiarization with the principles and working of computer colour matching instrument. Making of database of dyes, shade matching, shade correction, colour difference measurement, shade sorting, measurement of whiteness and yellowness index, etc. on the CCM instrument.

GT 421 Pattern Cutting & Making up-I **3/150**

(Common with TT.)

TT 402 Engineering of Textile Structure-II **3/150**

(Common with TT.)

FS 404 Textured Yarn Technology **3/150**

(Common with TT.)

GT 404 Garment Merchandising & Marketing **3/150**

(Common with TT.)

MS 406 Finance/Material & Human Resource Management 3/150

(Common with TT)

TC 408 Textile Auxiliaries & Chemicals 3/150

Detailed classification of textile Auxiliaries. Various anionic, cationic, and non-ionic agents with general methods of their preparation and their specific uses in textile processing. Physical principles involved in detergency, conditions for efficient detergency. Comparative method of determining the efficiency of wetting agents. Chemistry of resins, fire retardants, offgenders and other finishing agents. Evaluation methods.

TC 410 Textile Finishing-II 3/150

Principles and practice of finishing on cotton, wool, silk and rayons. Finishing materials, their functions and applications. Permanent and semi-permanent finishes, e.g. wash-n-wear, crease resistant, durable press, water repellent, soil release finishes, Rot and milden proofing, Fire proofing. Methods of evaluation of various finished on textile material.

TC 412 Developments in Textile Chemical Processing 3/150

Developments in pretreatment: Quick response pretreatment open width processing, use of environment friendly enzymes, chlorine-free bleaching, vaccum and steam impregnation etc. Other developments like solvent scouring, hot mercerization etc.

Developments in dyeing and dyes: New forms of dyes, i.e. encapsulated, polymeric, pearl and granular forms. New direct, reactive and disperse dyes. Dyeing of microfibre fabrics. Continuous dyeing, right-first-time approach. New techniques.

Developments in printing: Use of CAD, automated colour kitchens, Kerosene substitutes, Novel printing techniques like Jet printing, Xerox printing, transfer printing of cotton etc.

Developments in finishing, Zero formaldehyde easy-care finishes, polysiloxanes based softners, chlorine free shrink-resist treatment of wool. Breathable water-proof fabrics. Compacting (compressive shrinkage). Finishing of microfibre fabrics.

Waste management in Process House, water and steam consumption, reutilization of water, methods for recovery of chemicals, energy conservation, Effluent and pollution control, Waste treatment plants.

TC 414 Seminar

Each student will have to deliver a talk on the topics, in the weekly period allotted to the subject pertaining to his project work on any topic assigned by Head of the Department.

The performance of the speaker would be judged in the class by Board of Examiners.

TC 416 Project work **3/150**

In independent investigation of a problem in textile chemical under the supervision of a faculty advisor. A clear and systematic written presentation of the results in the form of project report will have to submitted atleast 15 days before the commencement of the Second Semester Examinations.

TC 418 Evaluation of Auxiliaries and finished textiles **3/150**

Moisture, particle size and estimation of the %age purity of dyes. Determination of the colour fastness to light, washing, rubbing, perspiration, etc. Evaluation of wetting agent, detergents, cross linking agents and finishing agents, Analysis of properties such as water repellency, fire retardancy, sublimation, measurement of viscosity. Estimation of BOD, DOD, TDS and other effluent and pollution related parameters.

TC 420 Industrial Wet Processing-II **4/150**

Printing on tables, flat-bed and rotary printing machines. Print fixation procedure. Finishing on stenter, calender, enzyme softening etc. quality control and developmental procedures at R&D Lab. Water softening plant, Effluent treatment plant, Boiler house, folding section, Energy conservation measures, Safety measures, ventilation & lighting, fire prevention measures.

GT 424 Pattern Cutting & Making up-II **3/150**

(Common with TT)