MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
B.TECH (TEXTILE CHEMISTRY) SEMESTER-III
'F' Scheme w.e.f 2010-11

Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
TT-201-F	Textile Raw Materials	3	1	-	4	50	100	-	150	3
TC-201-F	Physical & Organic Chemistry	3	1	-	4	50	100	-	150	3
TC-203-F	Yarn Formation	3	1	-	4	50	100	-	150	3
TC-205-F	Polymer & Fibre Chemistry	3	1	-	4	50	100	-	150	3
ME-217-F	Thermal Science	3	1	-	4	50	100	-	150	3
HUM-201-F	Engineering Economics	3	1	-	4	50	100	-	150	3
	Practicals									
TC-207-F	Yarn Formation Practical	-	-	3	3	50	-	50	100	4
TC-209-F	Qualitative Analysis of Organic Compounds	-	-	3	3	50	-	50	100	4
ME-219-F	Machine Drawing	-	-	2	2	50	-	50	100	4
TT-213-F	Fibre Microscopy & Identification	-	-	2	2	50	-	50	100	4
Total		**18**	**6**	**10**	**34**	**500**	**600**	**200**	**1300**	

TT-201-F TEXTILE RAW MATERIALS (COMMON WITH TT/FAE)

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

General definitions and important terminologies related to textiles; Classification of fibres; Essential and desirable properties of textile fibres and their role in final products; Advantages and disadvantages of natural and manmade fibres. Flow charts showing processes involved in textile industry.

Cotton: Geographical distribution, structure and properties (physical and chemical); Different Varieties including organic as well as Bt cotton and their properties; Applications.

Unit II

Bast and leaf fibres such as jute, hemp, sisal and ramie etc: Geographical distribution, extraction, properties and their uses.

Varieties of natural silk, rearing of silk worm, properties and uses of various types of silk; silk reeling, throwing and weighing.

Unit III

Varieties, sorting and grading of wool, chemical and physical properties of wool, processes involved in the removal of impurities from raw wool; numbering systems of woollen and worsted yarns.

General principles of manufacturing of man made fibres.

Unit IV

Brief outline of the manufacturing processes of important man-made fibres, viz. rayons (Viscose and Acetate), polynosic, tencel, nylons, polyester, acrylics, polypropylene, polyolefins, polyacrylonitrile and some technical speciality fibres like spandex/lycra etc (only flow charts); their Important physical and chemical properties and applications.

Reading List

Title	**Author**
Handbook of Textile Fibres	J Gordon Cook
Textile Fibres	HVS Murthy
Manmade Fibres	RW Moncrieff
Manufactured Fibre Technology	V B Gupta & V K Kothari

TC-201-F PHYSICAL & ORGANIC CHEMISTRY

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Stereochemistry: Isomerism and their classification, Structural, geometrical and optical isomerism; E, Z & R, S nomenclature.

Basic concept of organic molecules: Introduction, Inductive effect, Mesomeric effect, Electrometric effect, Hyper-conjugation, Resonance, Effect of these factors on the physical and chemical properties of substance.

Unit II

Homolytic and heterolytic fission of a covalent bond. Preparation, classification, structure and stability of Free radical carbocation, carbanions and carbine. Electrophile and nucleophile /

Organic Reactions and mechanism: Substitution Reactions, Types, Addition reactions, Types, Elimination reactions, Types and Rearrangement reactions. Directive influence of functional group in mono-substantiated benzene.

Unit III

Carbohydrates: Introduction, Classification. Properties, structure of Cellulose, Glycogen.

Chemical Kinetics: Rate of reaction. Definition of rate of reaction according to the law of mass action and rate law, Molecular reaction, order of reaction, Types of order of reaction; Derivation of rate constant for first order and second order reaction. Methods of determination of order of reaction and numericals related to them.

Unit IV

Colloidal Chemistry: Classification of particles i.e. colloids, crystalloids, suspension, Colloids Classification, preparation, purification and properties; Gels and emulsions; Application of Colloids.

pH of solution, Buffer Solution, Henderson's Equation and Numerical related to them. pH measurement by indicator and electrometric methods. Control and utility of pH in textile wet processing.

Reading List

Title	**Author**
Principles of Physical Chemistry	Puri,Sharma & Pathania
Text Book of Physical Chemistry	Samuel Glastone
Organic Chemistry (Vol I, II)	IL Finar
Organic Chemistry	Singh & Mukherjee

Organic Chemistry O P Aggarwal

TC-203-F YARN FORMATION (COMMON WITH FAE)

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Introduction to objectives of processes like ginning, mixing and blending.

Introduction to various preparatory processes involved in the production of yarn viz. opening and cleaning (blow room and card), drawing (draw frame), combing (comber) and rove formation (speed frame) with the objectives of each process.

Unit II

Introduction to different processes involved in the production of yarn viz. conventional (ring spinning) and unconventional (rotor, air-jet and friction spinning etc) with the objectives of each.

Properties and end uses of different types of yarns such as ring spun, rotor spun, friction spun and air-jet spun etc.

Unit III

Objectives of plying and twisting of spun and filament yarns.

Objectives and process description of reeling.

Brief description of fancy yarns: ply cable yarn; core spun yarn, sewing threads, slub yarn, grindle, mélange yarns etc.

Unit IV

Essential properties of a sewing thread.

Concept of yarn quality and its importance,

Yarn numbering systems and calculations pertaining to conversions,

Reading list

Title	**Author**
Spun Yarn Technology	Eric Oxtoby
Textile Science	Corbmann
Short Staple Spinning Series (Textile Institute)	W. Klein

TC-205-F POLYMER & FIBRE CHEMISTRY

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

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 polymerization reaction (addition, condensation) - their mechanism and kinetics with special reference to polyesters, polyamides. Ionic polymerization and their kinetics, living polymer. Phenol-formaldehyde, urea-formaldehyde, epoxy resins, Co-polymerization.

Unit II

Physical methods of polymerization (bulk, emulsion, solution, suspension, radiation, gaseous etc). concept of amorphous and crystalline polymer. Concept and determination of glass transition temperature. Thermal effect of polymers. polymer viscosities and their determination, DSC, DTA, TGA, Gel chromatography.

Polymer rheology, Viscous, visco-elastic and elastic properties of fibre. Rubber elasticity.

Unit III

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. Physical changes in Fibres after Mercerisation. Multicellular vegetable fibres.

Chemistry of regenerated man-made fibre. Cuprammonium rayon (lyocell, HWM Rayon, etc) and polynosic fibres. Preparation of cellulose acetate.

Unit IV

Chemical composition and constitution of wool and Silk.

Chemistry of nylon and other polyamide, Polyaramide (Kevlar, Nomex, etc) fibres. Chemistry of polyester and acrylonitrile fibres. Elastomeric (Spandex) fibres.

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

Reading List

Title	**Author**
Textile Chemistry Vol I & II	R H Peter
Textile Chemistry in the Laboratory	Bruce E Hartsuch
Organic Chemistry of Synthetic High Polymers	Robert W Lenz
Text Book of Polymer Science	Fred W Billmeyer
Polymer Science & Technology of Plastics	P Ghosh

& Rubber

ME- 217-F THERMAL SCIENCE (Common to TT & TC)

L	T	P
3	1	-

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Unit I

Basic Concepts and First Law of Thermodynamic: Macroscopic and Microscopic Approaches, Thermodynamic system, Thermodynamic properties, Equilibrium, State, Path, Process and Cycle, Quasi-static, Reversible and Irreversible Processes, Concept of Thermodynamic Work and Heat, Zeroth Law of Thermodynamic and its utility, First Law of Thermodynamics, Internal Energy and Enthalpy, PMMFK, Limitation of First Law, Steady Flow Energy Equation, First Law applied to Non-Flow Process, Steady Flow Process and Transient Flow process, Throttling process and Free Expansion Process

Unit II

Second Law of Thermodynamic and Entropy: Kelvin- Plank and Clausius Statement and their Equivalence, PMMSK, Carnot Cycle, Carnot Heat Engine, Carnot Theorem and its Corollaries, Entropy, Clausius Inequality, Principal of Entropy Increase, Temperature Entropy Plot, Entropy Change in different Processes, Third Law of Thermodynamics, Availability, Ir-reversibility

Unit III

Pure Substance and Air Conditioning: Pure Substance and its properties, Phase and Phase Transformation, Saturated and Superheated steam, Solid-Liquid-Vapour Equilibrium, T-V, P-V, P-T plot during Steam Formation, T-S and H-S Diagrams, Dryness fraction, Throttling and Separating Calorimeter, Psychrometric Chart, Psychrometric Terms, System of Humidification in Textile Industry, Cooling and Dehumidification, Heating and Humidification, Air Conditioning System

Unit IV

Fuel and Steam Generator: Different types of Fuels, Calorific Value, Bomb Calorimeter, Combustion Equation of Fuel, Orsat Appratus, Boiler Efficiency and Heat Losses in Boiler, Heat Balance Sheet, Boiler Drought, Height of Chimney, and High pressure Boilers

Reading List

Title	Author
Heat Engineering	VP Vasaandani & DS Kumar
The Theory & Practice of Heat Engines	DA Wrangham
Thermodynamics applied to Heat Engines	EH Lewit
Air Conditioning in Textile Mills	SP Patel & K Subramaniyan
Engineering Thermodynamics	P K Nag
Thermodynamics and Thermal Engineering	J Selwin Rajadurai

HUM-201-F ENGINEERING ECONOMICS

(Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE, TT, FAE, TC)

L	T	P			
3	1	-	Class Work	:	50 Marks
			Theory	:	100 Marks
			Total	:	150 Marks
			Duration of Exam.	:	3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics.

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

Section-B

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Section-C

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Section-D

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

TEXT BOOKS:

1. Principles of Economics: P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS:

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics : S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy: Rudar Dutt & K.P.M. Sundhram

TC-207-F YARN FORMATION PRACTICAL (COMMON WITH FAE)

L	T	P			
-	-	3	Class work	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Discussion and demonstration of the various machines and of manufacturing processes involved in converting fibres to yarn viz. mixing, blending, opening, cleaning, carding, drawing, combing, rove formation, spinning, doubling etc.; Introduction to unconventional spinning machines/processes; Rotor spinning, Air-jet spinning and Friction spinning etc.; Simple Calculations pertaining to these machines/processes.

TC-209-F QUALITATIVE ANALYSIS OF ORGANIC COMPOUNDS

L	T	P			
-	-	3	Class work	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Detection of extra elements (i.e. Nitrogen, Sulphur & Halogenes and functional groups (i.e. Carboxyl, Phenolic, Alcoholic, Aldehydic, ketonic, Esteric, Amides, Amines, Anilides, Thioamides, Nitro, Carbohydrate and hydrocarbons
Test for Aromaticity of unsaturation in organic compounds,
Determination of melting and boiling point of the organic compounds,
Formation of derivatives of organic compounds,
Determination of melting / boiling point of the derivatives

ME-219-F MACHINE DRAWING (Common to TT & TC)

L	T	P		
	-	2	Sessional	: 50 Marks
			Theory	: 50 Marks
			Total	: 100 Marks
			Duration of Exam	: 4 hrs

Technical terminology and drawing conventions, Conventional representation of spring, gears, and bearings etc., Screw threads – forms of threads, triangular and square. Riveted joints: forms and proportion of rivets joints, lap and butt joints, Shaft coupling- muff, flange and flexible coupling.

Bearings – journal, bush, thrust and pivot bearings. Gears and train of gears, Cams: construction and linkage.

TT-213-F FIBRE MICROSCOPY & IDENTIFICATION (Common with TT/FAE)

L	T	P
-	-	2

Class work	:	50
Examination	:	50
Total	:	100
Exam duration	:	4 hrs

Principle of microscopy, Microscopic identification of fibres, preparation and mounting of specimen for longitudinal view, Cross-section cutting. Microtomy - cork method, metal plate method, Hardy's Microtome, Mountants and reagents for fibre microscopy; Identification of fibre by burning as well as solubility tests. Standard scheme of analysis of homogenous fibre blends by physical and chemical methods, Qualitative and quantitative determination of components.

Preparation of reagents used for chemical analysis.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
B.TECH (TEXTILE CHEMISTRY) SEMESTER-IV
'F' Scheme w.e.f 2010-11

Course No.	**Course Title**	**Teaching Schedule**				**Marks of Class work**	**Examination**		**Total Marks**	**Duration of Exam**
		L	T	P	Total		Theory	Practical		
TT-202-F	Man-Made Fibre Production	3	1	-	4	50	100	-	150	3
TC-202-F	Unit Organic Process & Chemical Engg	3	1	-	4	50	100	-	150	3
TC-204-F	Fabric Formation	3	1	-	4	50	100	-	150	3
TC-206-F	Preparatory Wet Processing	3	1	-	4	50	100	-	150	3
TT-210-F	Computer Aided Designing	3	1	-	4	50	100	-	150	3
MA-201-F	Applied Statistics & Operations Research	3	1	-	4	50	100	-	150	3
	Practicals									
TC-208-F	Fabric Formation Practical	-	-	3	3	50	-	50	100	4
TC-210-F	Preparatory Wet Process Lab	-	-	3	3	50	-	50	100	4
TC-212-F	Analytical Chemistry Lab	-	-	2	2	50	-	50	100	4
TT-218-F	Computer Aided Textile Design	-	-	2	2	50	-	50	100	4
Total		**18**	**6**	**10**	**34**	**500**	**600**	**200**	**1300**	

TT-202-F MAN-MADE FIBRE PRODUCTION (common to TC & TT)

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT 1

General definitions related to man-made/manufactured fibres. Introduction to manufacturing processes of these fibres. Study of various spinning systems: melt, wet & dry spinning – basic principles. Brief details of spinning head, spinneret, quench chamber, drying chamber & coagulation bath. Spin finish application.

UNIT – II

Regenerated fibres: Viscose rayon – detailed manufacturing process with reactions at each stage. Polynosics, Super high wet modulus rayons, Brief manufacturing processes of lyocell and tencel fibres.

UNIT – III

Polyacrylonitrile: Addition of comonomers, continuous suspension, polymerization technique. Solution spinning techniques, Coagulation bath variables, Macrovoid generation and their remedies, Effect of spinning variables on structure and properties of gel and final fibres.

Polypropylene: Polymerisation technique (suspension & gas phase), Superactive catalysts, spinning of filaments, Major drawbacks and their possible remedies.

UNIT – IV

Polyethylene terephthalate: Polymerisation technique (batch & continuous), side reactions, degradation reactions – their control, Production of filament yarns and staple fibres, Brief description of manufacturing technique of high tenacity polyethylene terephthalate.

Nylon 6 & nylon 66: Polymerisation techniques in VK tube (batch & continuous), side reactions, Integrated continuous process for nylon 66, Filament spinning technique.

TC-202-F ORGANIC PROCESS & CHEMICAL ENGINEERING

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

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 manufacture with flow sheet for each process.
Nitration, sulphonation, oxidation, reduction, ammonolysis, halogenation, alkylation. Diazotization and coupling.

Unit II

Manufacture of dye intermediates based on above processes.
Definition and scope of chemical engineering, Unit operations of chemical engineering, material balance and molecular units, mole fractions, Gas laws, simple calculations based on these laws.

Unit III

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 content, bound, unbound and free water.
Evaporation: Evaporator types and their description, accessories, capacity, heat and material balance, evaluation of boiling point.

Unit IV

Distillation: 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 material of construction
Industrial hazards in chemical industry.

Reading List

Title	**Author**
Unit Processes in Organic Syntheses	RH Groggins
Chemistry of Synthetic dyes	K Venkataraman
Introduction to Chemical Engineering	WL Badger
Unit Operations of Chemical Engg	WL McCabe
A Text Book of Engineering Chemistry	MM Uppal
A Glimpse on the Chemical Technology	RR Chakraborty

of Textile Fibres

TC-204-F FABRIC FORMATION (common with FAE)

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Introduction to warp and weft preparatory processes in relation to production of fabrics with flow charts.

Winding : Objectives of winding, Flow of material through a winding machine, different devices of a winding machine viz. yarn clearers, yarn tensioners, waxing device, knotter, splicer, balloon breaker, automatic bobbin replacement. Brief description of Random and Precision winding, assembly winding, rotary motion of drum and traverse motion.

Unit II

Warping: Objectives of warping, Direct and sectional warping: flow of material through these machines, steps of preparation of beam on these machines. Types of creel.

Sizing: Objectives of sizing. Brief introduction to Types of sizing viz aqueous and solvent slasher sizing machine, foam sizing, sinter roller sizing, hot melt sizing and single end sizing, Sizing ingredients: adhesives and different categories of additives.

Unit III

Pirn winding and Drawing-in: Objectives and flow of material through these operations.
Shuttle Looms: Definition of handloom, plain loom, and automatic loom. Introduction to various mechanisms of a loom viz. primary, secondary and auxiliary motion

Unit IV

Shuttleless looms: Classification, Their advantages over shuttle looms. Brief description of Sulzer projectile loom, rapier looms, air-jet looms, water jet looms and their salient features.

Fabric Analysis: Simple calculations for fabric weight per unit area, linear weight, cover and cover factors.

Reading List

Title	**Author**
Principles of Weaving	Marks & Robinson
Cotton Yarn weaving	ATIRA
Textile Science	Corbmann
NCUTE's Manual	

TC-206-F PREPARATORY WET PROCESSING

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Impurities in fibres and greige fabrics (Cotton, Wool, Silk and Synthetic fibre) Preparatory sequences required for their removal. Chemistry and technology of singeing, desizing, scouring and bleaching of natural and man-made fibre fabrics and their blends.

Unit II

Machines used for batch wise and continuous scouring and bleaching. Mechanism of bleaching by various bleaching agents such as bleaching powder, sodium hypochlorite, hydrogen peroxide, sodium chlorite etc.

Unit III

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 oxi-cellulose and hydrocellulose. Determination of efficiency of various preparatory processes.

Unit IV

Physical and chemical aspects of mercerization, Efficiency of mercerization, Machines for yarn and fabric mercerization, hot mercerization and Liquid ammonia treatment.

Auxiliaries used in scouring, bleaching and mercerizing.

Reading List

Title	**Author**
Textile Chemistry	RH Peters
Mercerizing	JT Marsh
Textile Scouring and Bleaching	ER Trotman
Technology of Bleaching & Mercerizing	VA Shenai

TT-210-F COMPUTER AIDED DESIGNING (Common to TT & TC)

L	T	P			
3	1	-	Class work	:	50
			Exam	:	100
			Total	:	150
			Exam Duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Fundamentals of CAD: Definition, History , Hardware and Software requirements of CAD, Design Process, Application, Use, Creating the manufacturing Data base and benefits of CAD.

Hardware in CAD: Introduction, Design workstation, Graphics terminal, input and output devices, central processing unit and secondary storage.

Unit II

Computer Graphics Software and Database – Introduction, Software configuration of a graphic system, functions of a graphic package, transformations, Database structure and content, wire frame versus solid modeling, CAD features and CAD integration. Drawing aids, free hand sketching, Enhancement drawing. Feature based design process.

Unit III

Introduction to Computer Graphics: Computer Graphics and its applications, Computer Graphics Hardware and Software. Two dimensional graphics primitives – Point and Lines, Line drawing algorithms: DDA, Bresenham's; Circle drawing algorithms: midpoint circle drawing algorithm, Bresenham's circle drawing algorithm.

Unit IV

Introduction to Software Packages:

Introduction to Auto-CAD: Features, Basic Drawing Techniques: Drawing Line, Circle, Rectangle, Arc, Polyline, Ellipse, Elliptical Arc, Polygons, Donuts, Corner rounding, Chamfering, Displacing, Duplicating, Removing Objects.

Introduction to Corel Draw: Features and basic drawing techniques.

Introduction to Photoshop: Features and basic drawing techniques.

Reading List

Title	**Author**
Computer Aided Design & Manufacturing	Mikcle P Groover, Emory W. Zimmers Jr
Computer Graphics Principles & Practices	James D Foley, Andeies Van Da Shvan K Feiner Steven, John F Hughes
Computer Graphics	Donald Mearn & M Pauline Baker
Mastering AUTOCAD 2004 & AUTOCAD LT	George Omura

MA-201-F APPLIED STATISTICS & OPERATIONS RESEARCH (common to TT & TC)

L	T	P			
3	1	-	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Measures of Dispersion: Range, quartile deviation, standard deviation, moments, skewness and Kurtosis (definition, properties and associated numerical only)

Regression and Correlation: Karl Pearson's coefficient of correlation, rank correlation and line's of regression, curve fitting (linear, parabolic, and exponential)

Unit II

Theory of Probability: The concept of probability, additive and multiplicative laws of probability (Statements and associated numerical only)

Probability Distributions: Random variate, mathematical expectation, theorems on expectation, discrete and continuous probability distributions (definition and problems only). Univariate Binomial, Poisson and Normal distribution (properties and applications)

Unit III

Sampling Theory: Population and sample, types of sampling, sampling distribution of means and proportions (definition only)

Tests of Hypothesis and Significance: Definition of statistical hypothesis, null hypothesis, type I and type II errors and level of significance. Tests of significance for large and small samples (discussion) problem based on X^2 test for goodness of fit, t-test, F-test and Analysis of variance (one way and two way classifications)

Unit IV

Operations Research: Linear programming problem (formulation and solution by graphical approach only). Transportation problem including time minimizing problems, Basic Assignment problem, sequencing problems (n jobs, 2 machines and n jobs, m machine problems)

Project scheduling by PERT/CPM: Definition of network, critical path, floats, finding of critical path and floats.

Reading List

Title	**Author**
Mathematical Statistics	Ray and Sharma
Business Statistics	Gupta & Gupta
Theory and problems of probability and Statistics	Murray P Spiegel
Operation Research	P.K. Gupta, Manmohan
Operations Research for Management	Gupta & Sharma
Higher Engineering Mathematics	B.S. Grewal

TC-208-F FABRIC FORMATION PRACTICAL (common with FAE)

L	T	P			
-	-	3	Class work	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Basic principles of woven fabric analysis: estimation of data for cloth reproduction, Identification of yarns and materials used in their construction.

Weave analysis, Sett, Cover factor, Count and weight calculations for simple and compound woven structures, Specifications of standard woven fabric.

Discussion and Demonstration of various machines and of manufacturing processes involved in converting yarns to fabric winding, warping, sizing, Drawing-in, weaving by Hand looms, Plain Looms.

Automatic Shuttle Looms, Shuttleless Looms and Knitting, Passage of material through them and brief study of their essential components and mechanisms.
Simple production and efficiency calculations pertaining to these processes,

TC-210-F PREPARATORY WET PROCESSING LAB

L	T	P			
-	-	3	Class work	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Desizing of cotton by enzymatic and oxidative method. Scouring by caustic soda boil, enzymatic and solvent scouring. Bleaching using Sodium hypochlorite and hydrogen peroxide and assessment process of bleaching process. Two stage and single stage preparatory processes. Estimation of available chlorine in hypochlorite bath and peroxide content in hydrogen peroxide bath. Scouring and bleaching of wool. Degumming and bleaching of silk. Scouring and bleaching of polyester and blends. Mercerization of cotton by various methods and its evaluation.

TC-212-F ANALYTICAL CHEMISTRY LAB

L	T	P			
-	-	2	Class work	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Use of pH meter. Identification of important intermediates in dyes, e.g. aniline, benzidine, nitroanilines, beta naphthol, etc. A few estimations from these intermediates. Determination of copper number, methylene number and carboxyl group in degraded cellulose, determination of barium number. Damage in wool, analysis of free formaldehyde. Paper chromatographic technique and thin layer chromatography their application in textiles.

TT-218-F COMPUTER AIDED TEXTILE DESIGNING (common to TT & TC)

L	T	P			
-	-	2	Class work	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Introduction to graphical representations: live graphics, pixel graphics, Graphic systems and peripherals. Graphic standards/formats, file conversion initiatives, drawing simple geometric figures. Implementation of various aspects and commands of Corel Draw including 2D and 3D graphic design, other Design Software (Textile and Garments) and drawing objects such as Line, Circle, Arc, Ellipse, Elliptical Arcs, Xlines, Rays, Multiline, Polylines, Rectangles, Polygones, Donuts and Spline etc.

Introduction to Textile Design Software, Uses of various tools, Selection and creation of motifs, uses of colour tools, knowledge of repeats, selection and creation of fancy yarns, selction and creation of different types of weaves, Development of dobby and jacquard designs using CAD software.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 3rd YEAR TEXTILE CHEMISTRY (TC)
5th SEMESTER
Proposed 'F' Scheme w.e.f 2011-12

Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
TT-301-F	Structure & Properties of Fibres (common with TT)	3	1	-	4	50	100	-	150	3
TC-303-F	Technology of Dyeing	3	1	-	4	50	100	-	150	3
TC-305-F	Chemistry of Dyes	3	1	-	4	50	100	-	150	3
TT-307-F	Textile Testing-I (common with TT)	3	1	-	4	50	100	-	150	3
TC-309-F	Textile Design	3	1	-	4	50	100	-	150	3
TT-311-F	Garment Manufacturing Technology (Common with TT)	3	1	-	4	50	100	-	150	3
	Practicals									
TC-313-F	Dyeing Lab-I	-	-	3	3	50	-	50	100	4
TC-315-F	Technical Analysis Lab	-	-	3	3	50	-	50	100	4
TT-317-F	Textile Testing Practical-I (common with TT)	-	-	2	2	50	-	50	100	4
TT-319-F	Pattern Cutting & Making-Up (common with TT)	-	-	2	2	50	-	50	100	4
Total		**18**	**6**	**10**	**34**	**500**	**600**	**200**	**1300**	

TT-301-F STRUCTURE AND PROPERTIES OF FIBRES (COMMON WITH TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

TC-303-F TECHNOLOGY OF DYEING

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

Introduction to textile dyes – general classification, Colour Index and nomenclature of commercial dyes.

Direct dyes- Mechanism of direct dyeing, dye-fibre bond, effect of electrolytes, temperature and liquor ratio. Concept of percentage shade, application method for direct dyes on cellulosics and after treatments.

Dyeing with Azoics – Introduction to Azoic colours, methods of dissolution for naphthols, concept and process of diazotization, coupling reaction.

UNIT – II

Reactive colours - Reactivity and affinity of dyes, concept of hydrolysis. Application methods for chlorotriazine dyes and influence of process parameters. Dyeing mechanism for vinylsulphones, application process, continuous application techniques and after treatments. Concept of bifunctional dyes, reactive dyes for non-cellulosic substrates.

Vat dyes - Introduction, commercial vat dyes and forms, concept of vatting and particle size. Classification of vat dyes, principles and application of vat dyes. Leuco vat, pigment padding, semi pigmentation and vat acid processes.

UNIT – III

Dyeing with Sulphur dyes - General considerations of sulphur colours, classification based on dissolution and application techniques. Reduction of sulphur dyes, oxidation process, precautions in dyeing, topping and bronziness of shades. Fastness and their improvement, stripping and sulphur black tendering.

Principles and technology of dyeing with indigosols, pigments and oxidation colours.

UNIT – IV

Dyeing of protein fibres with acid, metal- complex and mordant dyes. Classification of these dyes, their mechanisms of action and effect of process parameters.

Compatibility of dyes in mixtures.

Reading List

Title	**Author**
Technology of Dyeing	VA Shenai
Dyeing and Chemical Technology of Textile Fibres	ER Trotman
Cellulosic Dyeing	John Shore

TC-305-F CHEMISTRY OF DYES

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

Dye intermediates and its chemistry. fluorescence and phosphorescence, isomers (geometric and optical). Colour & Constitution. Classification of dyes according to chemical constitution and application. Different types of chromophores.

UNIT – II

Coupling of different naphthols, Chemistry including the synthesis of a few members of direct, acid, basic dyes. Developments of acid and basic dyes.

UNIT – III

Chemistry of azoic colours. Chemistry of vat dyes, sulphur dyes and sulphurised vat.

UNIT – IV

Disperse & reactive dyes. Developments of colourants (ink for printing. Fluorescent colour, and other industrial application). Chemistry of optical brightening agents. Chemistry of pigments.

Reading List

Title	**Author**
Colour Chemistry	R L M Allen
Chemistry of Synthetic Dyes	K Venkatraman
Industrial Dyes	Klaus Hunger
Principles of Organic Synthesis	R O C Norman

TT-307-F TEXTILE TESTING-I (COMMON WITH TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

TC-309-F TEXTILE DESIGN

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

Classification of fabrics, constructional features of various woven fabrics, methods of ornamenting fabric

Construction of plain weave and their derivatives

UNIT – II

Twill and sateen weaves and their derivative

Stripe and check effects by combination of two weaves.

Vertical and horizontal hair line effect and check effect.

UNIT – III

Diamond weaves. Spot figure design on plain, twill and sateen bases. Crepe weaves, cork screw weaves, bedford cord.

UNIT – IV

Welts and Pique structures; Mock leno; Huckaback; Honeycomb

Reading List

Title	**Author**
Watson's Textile Design & Colour	Watson
Woven cloth Construction	Goerner
Elementary of Textile Design	Nisbet

TT-311-F GARMENT MANUFACTURING TECHNOLOGY (COMMON WITH TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

TC-313-F DYEING LAB-I

L	T	P
-	-	3

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

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, sulphur, vat and indigosol. Effect of various fixation methods for reactive dyeing. Pigment dyeing. Measurement of dye exhaustion by Spectrophotometer.

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

TC-315-F TECHNICAL ANALYSIS LAB

L	T	P
-	-	3

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

Identification of dyes and certain intermediates on materials and in substances 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.

TT-317-F TEXTILE TESTING PRACTICAL- I (COMMON WITH TT)

L	T	P
-	-	2

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

TTE-319-F PATTERN CUTTING & MAKING UP (COMMON WITH TT)

L	T	P
-	-	2

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 3rd YEAR TEXTILE CHEMISTRY (TC)
6th SEMESTER
Proposed 'F' Scheme w.e.f 2011-12

Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
TC-302-F	Processing of Synthetics & Blends	3	1	-	4	50	100	-	150	3
TC-304-F	Textile Printing	3	1	-	4	50	100	-	150	3
TT-306-F	Textile Testing-II (common with TT)	3	1	-	4	50	100	-	150	3
TC-308-F	Textile Finishing-I	3	1	-	4	50	100	-	150	3
TC-310-F	Garment Processing & Quality Control	3	1	-	4	50	100	-	150	3
HUM-312-F	Merchandising & Export Management (common with TT)	3	1	-	4	50	100	-	150	3
	Practicals									
TC-314-F	Dyeing Lab-II	-	-	3	3	50	-	50	100	4
TC-316-F	Printing Lab	-	-	3	3	50	-	50	100	4
TT-318-F	Textile Testing Practical-II (common with TT)	-	-	2	2	50	-	50	100	4
TC-320-F	Industrial Wet Processing	-	-	2	2	50	-	50	100	4
Total		18	6	10	34	500	600	200	1300	

TC-302-F PROCESSING OF SYNTHETICS & BLENDS

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

Chemistry and Technology of chemical processing of polyester, nylon and acrylics.

UNIT – II

Dyeing of important blends of natural and synthetic fibre fabrics. Analysis and remedy of barre effect. Developments of synthetic fibre dyeing and other chemical processing.

UNIT – III

Dyeing of microfibre fabrics. Dyeing machines for dyeing fibre, yarn and fabric. Mass colouration. Colouration of polypropylene. Weight reduction treatment of polyester. Machines use for batch, semicontinuous and continuous process.

UNIT – IV

Styles and techniques of printing synthetics and blended textiles. Heat setting and other finishing (Antisoiling, antimicrobial, antistatic, antipilling etc.) techniques.

Reading List

Title	**Author**
Chemical processing of Synthetic Fibres & Blends	KC Datye, AA Vaidya

TC-304-F TEXTILE PRINTING

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

Methods of printing viz block, roller, screen and transfer printing. Special effects like Batik, tie and dye etc. Design making and screen exposing. Table, flatbed and rotary screen printing.

UNIT – II

Composition of printing paste. Printing ingredients and their function. Styles of printing, i.e. direct, discharge and resist.

Printing wit direct and azoic colours.

UNIT – III

Printing with, vat, solubilised vat, aniline black, reactive, acid and metal complex dyes in different styles.

UNIT – IV

Various discharging and resisting agents. Pigment printing. Transfer printing of cotton and polyester.

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

Reading List

Title	**Author**
Technology of Printing	VA Shenai
Textile Printing	LWC Miles

TT-306-F TEXTILE TESTING-II (COMMON WITH TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

TC-308-F TEXTILE FINISHING-I

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

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

UNIT – II

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

UNIT – III

Classification and chemistry of softeners, their application on textiles, merits and demerits. Macro, micro and nano emulsions.

UNIT – IV

Minimum application techniques, foam finishing, vacuum systems, open width washers.

Reading List

Title	**Author**
An Introduction to Textile Finishing	JT Marsh
The Technology of Textile Finishing, Vol X	VA Shenai

TC-310-F GARMENT PROCESSING & QUALITY CONTROL

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

UNIT – I

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

UNIT – II

Garment Processing: Dyeing of denim using Indigo Dye, Ring dyeing techniques, factors affecting dyes build-up on cellulosic material, continuous Indigo dyeing range, new Indigo vetting & dyeing techniques, finishing of denim fabric, types of denim fabrics and garment printing techniques.

UNIT – III

Garment Dyeing Machinery, Dyeing and processing of cotton garments, polyester, woolen, acrylic and blended garments, Garment wash technique, Stone-wash, Enzymatic stone wash, stain removal.

UNIT – IV

Inspection systems – raw material inspection, in process inspection, final inspection, Comparability checks.

Quality Control, Tools of Quality Control; Production planning in garment manufacturing; Cost structure in garment manufacturing; Production technology – manual and mechanical systems.

Reading List

Title	**Author**
Denim- a fabric for all (Dyeing, Weaving, finishing)	Parmar MS & Others
An Introduction to Quality Control for Apparel Industry	PV Mehta
Managing Quality for Apparel Industry	PV Mehta & SK Bhardwaj

TT-312-F MERCHANDISING & EXPORT MANAGEMENT (COMMON WITH TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Duration of exam:		3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

TC-314-F DYEING LAB-II

L	T	P
-	-	3

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

Dyeing of polyester with disperse dye by various methods: carrier, high temperature & high pressure and thermosol dyeing. Effect of carrier concentration on dye uptake of polyester. Dyeing of Acrylic, effect of retardants. Dyeing of nylon with acid and metal complex dyes, effect of dye fixing agents. Dyeing of various blends viz. polyester/cotton, polyester/viscose, polyester/wool, cotton/wool, acrylic/wool, etc.

TC-316-F PRINTING LAB

L	T	P
-	-	3

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

Preparation of thickeners, Printing with direct dyes.
Cotton printing with reactive dyes - effect of dry heat, steaming and pad-batch 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. Pigment printing.

Polyester printing with disperse dyes, printing of nylon with acid, reactive and disperse dyes. Printing of acrylic with basic dyes.

TT-318-F TEXTILE TESTING PRACTICAL-II (COMMON WITH TT)

L	T	P
-	-	2

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

TC-320-F INDUSTRIAL WET PROCESSING

L	T	P
-	-	2

Classwork	:	50
Examination	:	50
Total	:	100
Duration of exam:		4 hrs

Orientation in Mill to get acquaintance with Singeing, desizing, scouring and bleaching, bleaching of coloured goods, Mercerization of yarn and cloth. Dyeing of loose fibre, cheese, hanks and fabrics in different machines. Single and multicolored printing.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
B.TECH (TEXTILE CHEMISTRY) SEMESTER-VII (2012-13)
'F' scheme w.e.f 2012-13

Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
TC 401-F	Textile Chemical Testing	3	1	-	4	50	100	-	150	3
TC 403-F	Textile Finishing-II	3	1	-	4	50	100	-	150	3
TT 405-F	Production Planning & Quality Management OR Waste Management & Pollution Control (common with TT)	3	1	-	4	50	100	-	150	3
TC 407-F	Wet Processing Machinery	3	1	-	4	50	100	-	150	3
TC 409-F	Theory of Coloration and Computer Colour Matching	3	1	-	4	50	100	-	150	3
HUM411-F	Finance, Material and Human Resource Management (common with TT)	3	1	-	4	50	100	-	150	3
TC 413-F	Colour Measurement & CCM lab	-	-	3	3	50	-	50	100	4
TC 415-F	Textile Finishing Lab	-	-	3	3	50	-	50	100	4
TC 417-F	Mill Practice	-	-	-	-	100	-	200	300	Viva
TC 418-F	Seminar	-	-	2	2	-	-	-	-	-
TC 419-F	Project Work (Mid Term Evaluation)	-	-	2	2	100	-	-	100	Viva
Total		**18**	**6**	**10**	**34**	**600**	**600**	**300**	**1500**	

B.TECH (TEXTILE CHEMISTRY) SEMESTER-VIII (2012-13)

Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
TT 402-F	Post Extrusion Operations (common with TT)	3	1	-	4	50	100	-	150	3
TC 404-F	Developments in Textile Chemical Processing	3	1	-	4	50	100	-	150	3
TC 406-F	Process Control in Chemical Processing	3	1	-	4	50	100	-	150	3
TC 408-F	Knitting & Knit Processing OR Eco-friendly Processing and Manufacturing of Textiles	3	1	-	4	50	100	-	150	3
TT 410-F	Technical Textiles OR Global Scenario of Textile Industry (Common with TT)	3	1	-	4	50	100	-	150	3
CSE 412-F	Computer Network & Applications (common with TT)	3	1	-	4	50	100	-	150	3
TT 414-F	Textile Colour & Design (common with TT)	-	-	3	3	50	-	50	100	4
CSE 416-F	Computer Networking Practical (common with TT)	-	-	3	3	50	-	50	100	4
TC 418-F	Seminar	-	-	2	2	200	-	-	200	Viva
TC 420-F	Project Work	-	-	2	2	-	-	200	200	Viva
Total		**18**	**6**	**10**	**34**	**600**	**600**	**300**	**1500**	

TEXTILE CHEMISTRY

SYLLABUS

SEVENTH SEMESTER

TC 401-F Textile Chemical Testing

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Introduction to textile chemical testing – aim and scope. Quantitative chemical analysis of textile fibres and their blends. Quantitative estimation of bleaching agents (hypochlorite, chlorite and peroxide) and dyes.

II Colour fastness of dyes on textiles (wash, light, rubbing, hot press, perspiration, etc). International standards (AATCC, ISO, ASTM, BIS). Evaluation of Wet treatments

III Estimation of mechanical and chemical degradation of cotton, wool, silk and polyester (aldehyde and carboxyl group estimation in cellulosics, amino group estimation of protein fibres, fluidity/viscosity measurement, critical dissolution time, etc).

IV Evaluation of various chemicals, auxiliaries used in wet processing plants. Analysis of fresh water and effluent. Measurement of viscosity of chemical ingredients, printing paste, instruments used in chemical analysis.

Reading List

Title	Author
Analytical Methods for a Textile laboratory	JW Weaver
Technology of Textile Processing	VA Shenai
An Introduction to Textile Bleaching	JT Marsh
AATCC Technical Manual Vol.-76	

TC 403-F Textile Finishing-II

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Principles and practice of finishing on cotton, wool, silk and rayon. Finishing materials, their functions and applications. Concepts of Permanent and semi-permanent finish. Dimensional stability finish, Mechanism of creasing and theory of anticrease finish, low and no formaldehyde cross linking agents, application of BTCA, CA, etc.

II Concept and mechanism of Flame retardandcy, Flammability of textile fibres. Flame retardant and proof finishes on natural fibres, synthetics and blends, temporary and durable finishes, phosphorylation and phosphonylation, LOI., etc. Water repellent finishes, Chemistry and application of silicone emulsion. Other water repellents.

III Soil release finish – mechanism of soiling, steps of soil release and theory, different soil release finishes, soil repellency, fluorocarbons and Teflon finishe. Antimicrobial finishing, chemistry of various antimicrobial finishes and application.

IV Rot and mildew proofing, classification of insects attack on wool. Chemicals required for rot and mildew proof finishes.
Methods of evaluation of various finishes on textile material.

Reading List

Title	Author
Chemical finishing of textiles	W.D.Schindler & P.J.Hauser (Woodhead Publishing Ltd.,UK)
Textile Auxiliaries and Finishing Chemicals	AA Vaidya, SS Trivedi
Technology of Textile Finishing	VA Shenai

TT 405-F Production Planning & Quality Management (common with TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

OR

TT405-F **Waste Management & Pollution Control (common with TT)**

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

TC 407-F Wet Processing Machinery

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Functional design of various Preparatory machines e.g. Singeing, Scouring, Mercerisation, Kiers and J Boxes, Open width wshers, continuous bleaching and steamers.

II Colouration machines for Fibres, lap, Tow and Yarn dyeing machines.

III Fabric dyeing machines - Jigger, winches, pressure beam, Various types jet (fully flooded, partially flooded, TSF) dyeing machines. Mangles.

IV Cylinder dryers, stenter, garment dyeing machines, rotary, flat-bed printing machines, calendars, raising and anti shrinkage range, Molten Metal dyeing machine.

Reading List

Title	Author
Textile Wet Processing Machinery	NB Peefel
Engineering in Textile Colouration	C Duckworth

TC 409-F Theory of Coloration & Computer Colour Matching

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Evolution of theories of dyeing. Fundamentals of kinetics and thermodynamics of dyeing. Diffusion of dyes. Methods for measurement of diffusion coefficient. Effect of fibre structure on dyeability and diffusion of dyes.

II Thermodynamic parameters like affinity and heat of dyeing. Thermodynamics of dyeing cotton with direct dye. Glass transition temperature and its influence on dyeing.

III Source of natural light, sources of artifical light, CIE illuminants, Absorption & scattering of light. Beer-Lambest law, Kubelka-Munk's Equation. Spectrophotometric curves and their relationship to pre-received colour. Instruments for the measurement of the colour of transparent and opaque objects. Principles of spectrophotometry. Colorimeters.

IV Munsell's system of colour specification. Relationship of hue, value and chroma. The 1931 CIE system. CMC. Additive and substractive mixing. Standard observer colour matching functions. Tristimulus values. Chromaticity coordinates. Metamerism. Whiteness & Yellowness Index, Computer aided Colour matching and recipe prediction.

Reading List

Title	Author
Textile Chemistry	RH Peters
Instrumental Colour	Shah & Gandhi
Theory of Coloration	CL Bird
CCM (Computer Colour Matching)	AD Sule
Cellulose Dyeing	John Shore
Technology of Textile Processing	VA Shenai

HUM 411-F Finance, Material and Human Resource Management (common with TT)

L	T	P
3	1	-

Classwork	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

TC 413-F Colour Measurement & CCM Lab

L	T	P
-	-	3

Classwork	:	50
Examination	:	50
Total	:	100
Exam duration	:	4 hrs

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, Familiarisation 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.

TC 415-F Textile Finishing Lab

L	T	P			
-	-	3	Classwork	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

Finishing of textiles to obtain different effects, e.g. crease resistance, water repellency, flame retardancy, softening, stiffening, soil release, etc. Heat setting and its evaluation. Dyed goods finish, printed goods finish, carbonising and newer chemical finishes. Simultaneous dyeing and finishing.

TC 417-F Mill Practice
(300)

TC 418-F Seminar 2(200)

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.
A Board of Examiners would judge the performance of the speaker in the class.

TC 419-F Project Work (Mid-term evaluation) 2(100)

EIGHTH SEMESTER

TT 402-F Post Extrusion Operations (common with TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

TC 404-F Developments in Textile Chemical Processing

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Developments in pretreatment: Quick response pretreatment, continuous open width processing, use of environment friendly enzymes, vacuum and steam impregnation etc. Other developments like solvent scouring, hot mercerization, etc.

II 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, Super critical CO_2 dyeing.

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

IV Developments in finishing, Zero formaldehyde easy-care finishes, polysiloxanes based softeners, chlorine free shrink-resist treatment of wool. Breathable water-proof fabrics. Finishing of microfibre fabrics.

Reading List

Title

Coloration Technology
Review of Progress in Coloration
AATCC Review

TC 406-F Process Control in Chemical Processing

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Introduction to Process Control. Quality of Grey Fabric, its specification, stitching of greige pieces. Process control parameters and norms for Singeing, Desizing, Scouring, Mercerizing, Bleaching.

II Control measures in Dyeing, Printing and their developments, Washing Process, Finishing – Stenter, Sanforizing, Curing chamber.

III Equipments(application of Tacho meter, pH meter, Twaddle meter, Baume meter, etc) for process control parameters. Testing involved at various stages in processing (with reference to Fabric, Chemicals/ Auxiliaries, Dyes).

IV Quality Assurance in Chemical Processing, TQM, Six Sigma. Monitoring and on line process control devices. Water pollution in wet processing, Quantitative measurement of effluents, ETP (Effluent Treatment Plant), Textile norms.

Reading List

Title

ATIRA/BTRA norms books and Journals

TC 408-F Knitting & Knit Processing

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I General description of knitting elements (needles, feeder, cam etc), layout of flat and circular weft knitting machines. Classification of knitting,

characteristics of warp and weft knit fabrics. Basic weft knit structures, properties and structure of plain fabrics.

II Structure and properties of Rib, Interlock, end purl fabrics. Fundamental stitches: knit, tuck, float and their uses. Basic calculations for fabric weight (gsm) and cover.

III Concept for knit processing, Tubular and open-width process routes, singeing, mercerizing. Twin soft flow machines for wet-treatment of knitted fabrics. Hydro-extraction and slitting, drying, compaction.

IV Typical recipes for different chemical processes of knits, processing of specialty fibre knitted fabrics like spandex fibre blends, Tencel etc.

Reading List

Title	Author
Knitting Technology	DJ Spencer
Knitting Technology	DB Ajgaonkar
International Dyer (Journal)	

OR

TC 408-F Eco-friendly Processing & Manufacturing of Textiles

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

I Emerging concepts in eco-friendly chemical processing – trends and practices, Newer dyes of novel chromophore and high fixation capability, low salt dyeing, natural dyes – merits and demerits, naturally coloured cotton.

II Eco-friendly chemicals for pretreatments, Coloration and finishing operations. Problems of heavy metals and AOX. Bio-technology applications in wet processing, plasma treatment and ultrasound applications.

III Environment friendly processes, low liquor ratio wet-treatments and machinery, Ultra filtration and reverse osmosis processes for textile waste water treatment. Recovery of chemicals from wash liquor.

IV Eco-friendly fibres – PLA (Polylactic acid) – production , properties and application, bamboo fibres, Chitosan fibre, Alternative to viscose process –

spinning of solutions of cellulose derivatives, use of new solvents, Tencel. Recovery and utilization of polyester, nylon and acrylic wastes.

Reading List
Title
Coloration Technology
Review of Progress in Coloration
AATCC Review

TT 410-F Technical Textiles (common with TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

OR

TT 410-F Global Scenario of Textile Industry (common with TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

CSE 412-F Computer Network & Applications (common with TT)

L	T	P			
3	1	-	Classwork	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

TT 414-F Textile Colour & Design (common with TT)

L	T	P			
-	-	3	Classwork	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

To show colour mixtures according to light theory and pigment theory of colour. To draw the Oswald's colour circle. To draw the chromatic circle and fill-up the colours. To show the arrangement of the primary, secondary and intermediate colours in the Brewster's theory. To modify a pigment colour by mixing with another colour. To modify a pigment colour by mixing with white (tints). To modify a pigment colour by mixing with black (shades). To obtain coloured greys of a colour. To produce monochromatic contrast. To produce polychromatic contrast of the following kinds:

a) Contrast of hue
b) Contrast of tone.

To produce harmony of analogy of a colour. To produce harmony of contrast of a colour, To produce floral, geometrical, abstract and border designs. Enlargement and reduction of designs. Simple Weave and colour effects. Compound colour and weave effects – stripe colour and weave effect, Check colour and weave effect, Special colour and weave effect, figured colour and weave effect. Placement of figures and motifs – half drop, double ½ drop, diamond base, ogee base, rectangular, horizontal, vertical etc.

CSE 416-F Computer Networking Practical (common with TT)

L	T	P			
-	-	3	Classwork	:	50
			Examination	:	50
			Total	:	100
			Exam duration	:	4 hrs

TC 418-F Seminar 2(200)

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.

TC 420-F Project Work 2(200)

Each student individually, or in association with some other students will carry out project of an experimental and/or theoretical nature in one of the main branches of textile chemistry 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 candidate would submit 3 typed copies of Project Report to the Head of the Department/Institution at least 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.