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SHIVAJI UNIVERSITY, KOLHAPUR.

Revised Syllabus of

(M.TEXT.(Textile Chemistry) Sem –I & IV)

To be introduced from the academic year 2010-11
(i.e. from June 2010) Onwards

(Subject to the modifications will be made from time to time)

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-I

ADVANCED TEXTILE CHEMICAL PROCESSING – I

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter 1. Process modifications in Pretreatments

Eco-friendly peracetic acid bleaching, Eco-friendly retting of Jute, Redox H₂O₂ bleaching, Concept of Eco-friendly stabilizers for H₂O₂ bleaching. Combined operations like desizing- scouring- bleaching, solvent scouring, Hot and ammonia mercerization, add-on mercerization

Chapter 2. Use of biotechnology in Pretreatments

Developments in singeing, desizing and its eco-aspects, size recovery, bleaching and its eco-aspects, classification of enzymes, Mode of action of enzyme, Factors affecting efficiency of enzyme treatment.

Enzyme retted flax using different formulations, influence of enzymatic pretreatment on the colours of bleached and dyed flax fibers, combined bioscouring and bleaching of cotton fibers, effect of ultrasound on the performance of industrial enzymes used in cotton bio-preparation/bio-finishing applications, Enzymatic degumming, enzymatic H₂O₂ bleaching, nano-biotechnology.

Chapter 3. Developments in Dyeing

Dyeing and its eco-aspects, new dyes and their advantages. Eco-friendly dyeing with sulphur & vat dyes. New developments in reactive dyes like HF dyes, low and no salt reactive dyes, multifunctional dyes, neutral fixing and acid fixing reactive dyes.

Photo chromic dyes, thermo chromic dyes, fluorescent dyes.

Natural Dyes - Sources and classification of natural dyes, extraction methods, mordents, dyeing of natural and synthetic fibrous material with natural dyes.

Super critical CO₂ dyeing – concept, mechanism, methods and techno-economical features.

Ultrasound in dyeing - Concept, mechanism, methods and techno-economical features.

Low temperature dyeing - concept, mechanism, methods and techno-economical features.

Chapter 4. Processing of Denim and Terry towel

Introduction to denim, types of Denim fabrics, chemistry and process of warp dyeing with indigo. Indigo dyeing equipments. Dyeing with mixture of indigo and other dyes.

Process sequence and machines used for terry towel manufacturing, essential properties of terry towel fabrics like pile properties. Type and application of terry fabrics. Different stages of towel processing and finishing.

Chapter 5. Processing of specialty fabrics

Carpet Processing - Different fibres suitable for carpets, types of carpets, essential properties of carpet fabric. Dyeing and printing of carpets. Mechanical and chemical finishing of carpets.

Processing of Lyocell - General properties and uses of lyocell (Tencel). Pretreatment, dyeing and finishing of lyocell. Concept of fibrillation, its causes and remedies.

Processing of Fabric containing spandex - Properties and uses of spandex fibres and blends. Wet processing of Cotton / Spandex, polyester / Spandex fabrics.

Note: Term work for this subject will be based on above syllabus.

REFERENCE BOOKS

1. Biotechnology in Textile processing, by Georg M. Guebitz, Artur Cavaco-paulo, Ryszard Kozlowski, The Hawarth Press, Inc.
2. Denim a Fabric for All by dr. Parmar, NITRA

3. Manufacturing of Terry Towel by Subhash J. patil, Universal Book Corporation, Mumbai.
4. Interior Furnishing by Mortimer O'shea, Textile Progress, Vol. 11, No. 1, Textile Institute.
5. Textile Floorcovering by G. H. Crowshaw, Textile Progress, Vol. 9, No. 2, Textile Institute.
6. Carpet Surface by H. Pointon, Textile Trade Press, UK.
7. Wool science and Technology by W. S. Simpsion, G. H. Crowshaw, Woodhead Publishing, Textile Institute.
8. Trouble shooting in Wet Processing: Acetate, Reyon / Lyocell and Spandex Blends, AATCC.
9. Handbook of Jute by T C Ranjan.
10. Environmental Issues – Technology option for Textile Industry Edited by R. B. Chavan, Indian Journal of Fibre & Textile Research Special Issue - March, 2001.
11. Eco-friendly Textiles Challenges to Textile Industry – Textile Committee.
12. Environmental Success – America Textile Industry, AATCC Symposium – 1996.
13. The Textile Industry: Achieving Our Environmental Commitment – AATCC Symposium – 1994.
14. Textile Energy & Waste Seminar – Textile Institute, 1997.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-I

HIGHTECH FIBRES-I

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter – I : Physical Fundamentals of Fibre Spinning Process –

General Principles of spinning process, Spinnability of liquids, rheology of spinning. Mechanism of spinning flow in the spinning spinneret channel, the exitzone & elongation of free fluid jet. Mechanism of solidification. General principles, heat transfer and temperature distribution, diffusion and phase transition. Formation of fibre structure – molecular orientation. Transition phenomena in a fibre forming melt solution.

Chapter – II : Viscoelastic Properties –

Boltzman super position principle, dynamic mechanical properties. Theories of shear viscosity – constitutive behaviour of dilute solutions – constitutive behaviour of concentrated solutions & melts.

Chapter-III : Modelling & Theoretical Basis for the Physical Behaviour of Synthetic Fibre –

Goals & Premises- Dependence on polymer physics – Key assumptions in polymer physics – Local inter molecular interactions – Concept of modeling. Various models of polymers / fibres. Eyrings model, Voigts model. Fringed micelle theory- Fibre structure models – Takayanagi models – Network model – Polymer physics of amorphous regions. WLF approach. Molecular & micro structural modeling fibres. Fibres properties – physical structure – Micro structural models – molecular modeling.

Chapter – IV : High Speed Spinning -

Concept of High speed spinning – Effects of speed on the dynamics of melt spinning – Tension & stress components in the spinning line – Cooling rate and temperature distribution – Neck line deformation & stability of high speed spinning – possible mechanisms of necking. Draw resonance Vs viscoelastic failure – Stress induced crystallization in the spinning line.

Chapter – V : Introduction to High Performance Fibres –

Structure of HM –HT fibres- molecular arrangements – Gross features. Stress strain properties, creep & recovery, time & temperature dependence of strength – Simplistic theory of tensile deformation.

Chapter-VI : Advances in Fibres -

Raw Materials, manufactures & physical & chemical properties of TENCEL, Lycra, Kodel-II, CDPET, Micro PET, Bionelles, Spectra @ R 800. Melt spinning of hollow fibres – technology – Theoretical investigation – Polymers for melt spun Hollow fibres – Fields of applications. Chemical modification of melt spun fibres – Modification of PET, Nylon 6 & Polypropylene.

Chapter-VII : Aramid Fibres -

Introduction – Raw materials, Polymer preparation, Spinning, Structure, Physical & Chemical properties & Applications of Kevlar & Nomex. Composites of Kevlar & Nomex.

Note: Term work for this subject will be based on above syllabus.

LIST OF REFERENCE BOOKS :-

- 1) Hand Book of Fibre Science & Technology- Vol-III Part B
- 2) New Fibres – Second Edition – T. Hongu & Phillips- Wood Head Publishing Ltd., Cambridge, England.
- 3) Advanced Fibres Spinning Technology – Prof. T. Nakajima - Wood Head Publishing Ltd., Cambridge, England.
- 4) Progress in Textiles : Science Vol.-II Textile Fibres Developments & Innovations – Dr. V.K. Kothari, IAFL Publication, New Delhi.
- 5) High Speed Fibre Spinning : Science & Engineering Aspects – A. Ziavicki & H. Kawai. A Wiley Inter Science Publication.
- 6) High Performance Fibres – J.W.S. Hearle, Wood Head Publishing Ltd., Cambridge, England.
- 7) Advances in Fibre Science : Dr.S.K. Mukhopadhyay, The Textile Institute, Manchester.
- 8) Physical Properties of Textile Fibres – W.E. Morton & J.W.S. Hearle. The Textile Institute, Manchester.
- 9) Kevlar Aramid Fibres – H.Yang – John Wiley & Sons.
- 10) Mechanisms of Textile & Laminated Composites – A.E. Bogdanovich & C.M. Pastore – Chapman & Hall.
- 11) Manufactured Fibre Technology – Dr.V.B. Gupta & Dr.V.K. Kothari, Chapman & Hall.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-I

ADVANCED COMPUTER APPLICATIONS IN TEXTILES

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

1) Artificial Neural Networks :-

Biological Neuron & their artificial models, Models of artificial neural neuron, Neural processing, learning & adaptation, Neural Network learning rules, Multilayer feed forward networks, Generalised error back pro-projection training algorithm, application of ANN in textiles : Yarn strength prediction using ANN. Case study.

2) E-Commerce :-

The scope of electronic commerce, definition of electronic commerce, E-commerce and the trade cycle, Electronic markets, Electronic data interchange, Internet Commerce, Business Strategy in E-commerce, The value chain, supply chain, Porter's value chain model. Inter organization value chains, Business to business E-commerce, Inter organizational transaction, The credit transaction trade cycle. Advantages & disadvantages of Electronic markets. Application of E-commerce in textile industries.

3) Introduction To ERP

Introduction to ERP, Basic ERP concepts, Justifying ERP Investments, RISK of ERP, Benefits of ERP.

4) ERP And Technology

ERP and Related Technologies, Business Intelligence (BI), Business Process Reengineering (BPR), Product Life Cycle Management, Supply Chain Management (SCM), Customer Relationship Management (CRM).

5) SAP

Architecture of SAP R/3, SAP Integrated- Analysis, Implementation, and Design, Three-Tier Architecture, Need of Multi-tier Architecture, Integrating Environments.

Note: Term work for this subject will be based on above syllabus.

REFERENCE BOOKS :-

- 1) Introduction to Artificial Neural Systems – J.M Zurada, Jaico Book.
- 2) E-Commerce – David Whiteley, TmH.
- 3) ERP Demystified - Alexis Leon, TMH
- 4) Enterprise Resource Planning – Alexis Leon, TMH.
- 5) Information Technology for Management,- Turban-McLean.
Wetherbe
- 6) SAP R/3 SAP Architecture, Administration, Basis, ABAP
Programming with MM and SD Modules – Dreamtech Press

M. TEXT (TEXTILE CHEMISTRY) SEMESTER – I
TECHNICAL TEXTILES

Lectures	:	3 hrs / week
Assignment	:	1 hr / week
Theory paper	:	100 marks
Term Work	:	50 marks
Subject Total	:	150 Marks

Chapter 1: Introduction to Technical Textile

Definition, significance and principles of technical textiles, difference between technical and non- technical textiles, classification of technical textiles

Chapter 2: Coated Textile – Textile and Coating materials

Textile materials and fibers, their properties, woven, knitted, non-woven materials.

Polymeric materials for coating and their properties like rubber (natural and synthetic), polyvinyl chloride, polyurethane, acrylic polymers.

Application of coated materials like synthetic leather, architectural textile, Fluid containers, tarpaulins, Automotive airbags, Carpet backing, textile foam laminates for interiors.

Water proof breathable fabrics – types, preparation and their performances assessment.

Chapter 3: Coating techniques

General features, Coating techniques like - knife, roll, Dip, transfer, grove, rotary screen, Calendering, hot melt, Scatter and Lamination.

Chapter 4: Performance evaluation of coated textiles

Physical properties of coated textiles and test methods like tensile strength, elongation, adhesion, tear resistance, weathering behavior, biodegradation, coating mass per unit area, degree of fusion, Damaged to flexing, test for fastness to dry and wet rubbing, Low temperature bend and impact test, water & air permeability / resistance, Penetration of hazardous chemicals, electrical resistivity.

Chapter 5: Medical Textiles

Materials used in biotextiles, classification of medical textiles, and textile for implantation, Non implantable textile, Extra corporal textile, healthcare and hygiene products

Chapter 6: safety and Protective textiles

High temperature textile , Flame resistant protective clothing, chemical protective clothing, Mechanical and electrical protective clothing, clean room textiles, Radiation protection, thermal insulation and high visibility textile, Metallised fabrics, space suits.

Chapter 7: Phase changing materials

Concept of Phase Change Materials, Mode of action of Phase Change materials, Application of Phase Change Materials.

Chapter 8: Shape memory polymers

Concepts associated with shape memory materials, principle of temperature dependant shape memory polymers, Application and prospects for shape memory polymers. Structure and synthesis of shape memory polymers, preparation of shape memory polymers for medical use. Water vapor permeability (WVP) of shape memory polyurethane (SMPU), equilibrium sorption and dynamic sorption of SMPU, temperature dependence of WVP through SMPU

Shape memory fibres, role of smart materials in textiles, shape memory material in smart fabrics and garments.

Chapter 9: Nano fibers

Various Methods of manufacturing of nano-fibres, properties and application of nano fibres

Note: Term work for this subject will be based on above syllabus.

REFERENCES:

1. Handbook of Technical Textiles by A.R. Horrocc and S. C. Anand
2. Coated Textiles Principles and Applications by Dr. A. K. Sen
3. Medical Textiles by Subhash Anand
4. Wellington Sear's Hand book of Industrial Textile by Rd. Sabit Adnur.
5. Shape memory polymers and Textiles by Jinlian HU
6. Clothing biosensory engineering by Y. Li and A.S.W. Wong
7. Biochemical Engineering of Textile and Cloting by Y. Li and X-Q. Dai

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-I

PHYSICAL METHODS OF ANALYSIS & ECO-TESTING(ELECTIVE-I)

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter I : Electron Microscopy :

Basic theory of electron microscopy.

imaging system, image-translating system of electron microscope. Principle, working procedure and application of scanning Electron Microscope and Transmission electron microscope.

Chapter II : Spectroscopy :

Infrared spectroscopy. Introduction, experimental techniques, Infrared spectra of natural and synthetic fibres. Identification of finishing agents using IR. FTIR spectroscopy.

X-ray diffraction and Fluorescence. Principle, working procedure of X-ray diffraction technique. X-ray diffraction of natural and synthetic fibres. X-ray Fluorescence and its application to textile related materials.

NMR and Mass Spectroscopy: Principle, working procedure and application of NMR and Mass Spectroscope.

Chapter III : Chromatographic Methods :

Theoretical considerations of chromatography. Gas chromatography – Instrumentation, qualitative analysis, quantitative analysis, theory and applications. High Pressure Liquid Chromatography – Instrumentation and applications.

Chapter IV :Eco-Testing :

Concept of Banned Dyes, Chemicals and Auxiliaries. Testing and analysis of banned dyes, chemicals and auxiliaries used in Textiles.

Chapter V : Methods for Analyzing damage in Textile Materials :

Concept of Mechanical and Chemical damage. Methods for analyzing damage in natural and synthetic fibrous materials.

Note: Term work for this subject will be based on above syllabus.

REFERENCE BOOKS :-

1. Instrumental Methods of Analysis 7th Edition by H.H. Willard; L.L. Merritt, John A Dean, Frank A Settle, Jr. CBS Publishers & Distribution Delhi.
2. Instrumental Methods of Chemical Analysis 5th Edition by Galen W. Ewing.
3. 100 and More Basic NMR Experiments – A Practical course by S. Baraun, H.Kalinowski, S. Berger. Weinhein – New Yark, Basel Cambridge – Tokyo.
4. Elementary Organic Spectroscopy – Principles and Chemical Applications by Y.R. Sharma.
5. Spectroscopy of Organic Compounds by P.S. Kalsi
6. Basic Concepts of Analytical Chemistry, 2nd Edition by S.M. Khopkar
7. The Analytical Chemistry of Synthetic dyes Edited by K. Venkataraman. Wiley – Interscience Pub. John Wiley & Sons New York.
8. Hand Book of Textile Testing Part 1 to 4, Bureau of Indian Standards.
9. Instrumental Analysis of Cotton Cellulose & Modified Cotton Cellulose – Robert T.O' Connor.
10. Textile Laboratory Manual – W – Garner Vol.I & II.
11. Physical Methods of Investigating Textiles – ED R. Meredith J.W.S. Hearle.
12. Textile Laboratory Manual – Walter Garner.
13. Handbook of Environmental Health & Safety – Principles & Practices – Herman Koren, Michael Bisesi Vol.- I & II.
14. Textile Testing & Its Role in Textile Business with Special Reference to Eco-Friendly Textiles & Eco-Testing – Dr.G.S. Nadiger & S. Subramanian.
15. Handbook of Methods of Tests for Cotton Fibres, Yarns & Fibres – Dr.V. Sundaram & Dr. R.L.N. Iyengar.
16. Vibrational Spectroscopy Theory & Applications – D.N. Sathyanarayana.
17. Analytical Methods for a Textile Laboratory – J.W. Weaver.
18. Mass Spectroscopy – E. Constantin & A. Schanell.
19. Profiles in Analysis of Chemicals – Dr.N.F. Desai.
20. Introduction to Electron Microscopy – Saul Wischnitzer.
21. X-ray Diffraction Methods in Polymer Science – Alexander Leray E.
22. X-ray Diffraction – Cullity B.D.

**M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-I
NANOTECHNOLOGY IN TEXTILES (ELECTIVE-I)**

Lectures	:	3 Hrs / Week
Assignment	:	1 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

PART 1 NANOFIBER PRODUCTION

Electrospinning of nanofibers

- Introduction
- Principles of electrostatic atomization
- Electrospinning and electrospinning by the capillary method
- Electrospinning and Electrospinning by the charge injection method

Producing nanofibre structures by electrospinning for tissue engineering

- Introduction
- Fabrication of nanofibrous scaffolds
- Characterization of nanofibrous scaffolds
- Cell-scaffolds interaction

Continuous yarns from electrospun nanofibers

- Introduction
- Using electrospun nanofibers: background and terminology
- Controlling fiber orientation
- Producing non-continuous or short yarns
- Producing continuous yarns

Producing polyamide nanofibers by electrospinning

- Introduction
- The electrospinning process
- Measuring the mechanical properties of electrospun nanofibers
Measuring the effects of different spinning conditions and the use of high molecular weight polymers on the properties of electrospun nanofibers

- Improving the properties of electrospun nanofibers: experimental results

Controlling the morphologies of electrospun nanofibers

- Introduction
- The electrospinning process and fibre morphology
- Polymer concentration and fibre diameter
- Fibre bead formation and fibre surface morphology
- Controlling fibre alignment and web morphologies
- Bicomponent cross-sectional nanofibres
- Future trends

PART 2 CARBON NANOTUBES AND NANOCOMPOSITES

Synthesis, characterisation and applications of carbon nanotubes: the case of aerospace engineering

- Introduction
- The development and structure of carbon nanotubes
- Synthesis of carbon nanotubes
- Characterisation techniques
- Purification techniques
- The use of carbon nanotubes in aerospace engineering
- Nanostructured composite materials for aerospace applications
- Nanostructured solid propellents for rockets
- Frequency Selective Surfaces (FSS) for aerospace applications
- Other aerospace applications of carbon nanotubes

Carbon nanotube and nanofibre reinforced polymer fibres

- Introduction
- Synthesis and properties of carbon nanotubes
- Developing nanotube/nanofibre polymer composites
- Adding nanotubes and nanofibres to polymer fibres
- Analysing the rheological properties of nanotube/nanofibre polymer composites
- Analysing the microstructure of nanotube/nanofibre polymer composites
- Mechanical, electrical and other properties of nanocomposite fibres

Structure and properties of carbon nanotube-polymer nanofibers using melt spinning

- Introduction
- Producing carbon nanotube-polymer nanofibers
- Thermal characterisation
- Fiber morphology
- Mechanical properties of fibers

Multifunctional polymer nanocomposites for industrial applications

- Introduction
- The development of functional polymer nanocomposites
- Improving the mechanical properties of polymer nanocomposites
- Improving the fire retardant properties of polymer nanocomposites
- Improving the tribological properties of polymer nanocomposites
- Case-study: development of a nanocomposite sliding seal ring
- Enhancing the functionality of polymer nanocomposites

Nanofilled polypropylene fibers

- Introduction
- Polymer layered silicate nanocomposites
- The structure and properties of layered silicate polypropylene (PP) nanocomposites
- Nano-silica filled polypropylene nanocomposites
- Calcium carbonate and other additives

PART 3 IMPROVING POLYMER FUNCTIONALITY

Nanostructuring polymers with cyclodextrins

- Introduction
- Formation and characterisation of polymer-cyclodextrin-inclusion compounds
- Properties of polymer-cyclodextrin-inclusion compounds
- Homo- and block copolymers coalesced from their cyclodextrin-inclusion compounds
- Constrained polymerisation in monomer cyclodextrin-inclusion compounds

- Coalescence of common polymer-cyclodextrin-inclusion compounds to achieve fine polymer blends

- Temporal and thermal stabilities of polymers nanostructured with cyclodextrins

- Cyclodextrin-modified polymers

- Polymers with covalently-bonded cyclodextrins

Dyeable polypropylene (PP) via nanotechnology

- Introduction

- Dyeing techniques for unmodified polypropylene

- Modifying polypropylene for improved dyeability using copolymerisation and other techniques

- Polyblending and other techniques for improving polypropylene dyeability

- Dyeing polypropylene nanocomposites

- Using x-ray diffraction analysis and other techniques to assess dyed polypropylene nanocomposites

Polyolefin/clay nanocomposites

- Introduction

- Organomodification of clays

- Polyolefin/clay nanocomposites

- Polypropylene/clay nanocomposites

- Polyethylene/clay nanocomposites

- The range of polyolefin/clay nanocomposites

Multi-wall carbon nanotube-nylon 6 nanocomposites from polymerization

- Introduction

- Nanocomposite synthesis and production

- Characterisation techniques

- Properties of multi-wall carbon nanotube-nylon 6 nanocomposite fibers

PART 4 NANOCOATINGS AND SURFACE MODIFICATION TECHNIQUES

Nanotechnologies for coating and structuring of textiles

- Introduction

- Production of nanofiber nonwovens using electrostatic spinning

- Anti-adhesive nanocoating of fibres and textiles
- Water and oil-repellent coatings by plasma treatment
- Self-cleaning superhydrophobic surfaces

Electrostatic self-assembled nanolayer films for cotton fibers

- Introduction
- Principles of electrostatic self-assembly (ESA) for creating nanolayer films
- Advantages and disadvantages of electrostatic self-assembly
- Substrates used for ESA
- Polyelectrolytes used for ESA
- Analysing self-assembled nanolayer films on cotton

Nanofabrication of thin polymer films

- Introduction
- Macromolecular platform for nanofabrication
- 'Grafting from' technique for synthesis of polymer films
- 'Grafting to' technique for synthesis of polymer films
- Synthesis of smart switchable coatings
- Synthesis of ultrahydrophobic materials

Hybrid polymer nanolayers for surface modification of fibers

- Introduction: smart textiles via thin hybrid films
- Mechanisms of responsive behavior in thin polymer films
- Polymer–polymer hybrid layers
- Polymer–particles hybrid layers
- Hierarchical assembly of active nanostructured hybrid films

Structure-property relationships of polypropylene nanocomposite fibres

- Introduction
- Materials, processing and characterisation techniques
- Structure and morphology
- Phase homogeneity and spinline stability
- Optical birefringence and infra-red activation

- Crystallisation behaviour and mechanical performance
- Exfoliation by extensional flow deformation

Note: Term work for this subject will be based on above syllabus.

Reference Books :-

- 1) Nanofibres & Nanotechnology in Textiles by P.J. Brown & K. Stevens.
- 2) New Millennium Fibres by G.O. Phillips & M.Takigami.
- 3) Analytical Electrochemistry in Textiels by P. Westbroek, G. Priniotakis & P. Kiekens.
- 4) Smart Textiles for Medicine & Healthcare by L. Van Langenhove.
- 5) The Nanoscope, Encyclopedia of Nano Science & nanotechnology Vol.-I to VI, Dr. Parag Diwan & Ashish Bharadwaj.
- 6) Nanotechnology in Fibres matures : A New Perspective, Textile Progress, The Textile Institute by Rajesh D. Anandiwala.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-I

SEMINAR - I

Practical	:	1 hr/ week
Term Work	:	50 Marks
Subject Total	:	50 Marks

Seminar-I should be based on the literature survey on any topic relevant to textile chemistry (should be helpful for selecting a probable title of dissertation). Each student has to prepare a write up of about 15 pages of "A4" size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department and his/her classmates. The faculty members, based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally – jointly.

Some marks should be reserved for the attendance of the student in the seminars of the others students.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II

ADVANCED TEXTILE CHEMICAL PROCESSING-II

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter 1. Digital Printing

Concept, methods of inkjet printing, colour separation, selection of dyes and developments in inks, techno-economical features.

Chapter 2. Transfer Printing – Concept, selection of dyes and paper, mechanism of dye transfer, process sequences, techno-economical features, various transfer printing machines.

Chapter 3. Special Printing Effects – Advantages and disadvantages of pigment printing, various developments to overcome the problems, Special print recipes for fashion & garments. Khadi, Metallic, Floc, Plastizol, Reflective, Pearl, Fluorescent Printing, High Density Printing, Puff Printing, Foil Printing, Plastic Printing, Label Printing Defects, Garment defects.

Chapter 4. Speciality Finishes on Garments – Finishing of woven / knitted garments – stone wash, stoneless stone wash effects – mud wash, Ion wash, chalk wash etc. , various softening treatments, Bio polishing, Leather Finish, Protective Finishes – Antimicrobial, Deodorizing etc., Functional Finishes – Cool finish, Thermocat finishes, Wrinkle free finishes.

Wash down effects on Denim - Stone Wash, Enzyme Wash, Combined enzyme and stone wash, acid wash, antique wash, ball blast, whiskering, Sand blast, Ice wash.

Chapter 5. Application of Nanotechnology in Textiles

Nanoscale – Definition, various methods of manufacturing nano materials and their characterization

Nanofibers - Manufacturing, properties and uses of nanofibre,

Nanofinishes - Super hydrophobicity and lotus effect, self cleaning, UV protection, Antimicrobial finishes

Chapter 6. Application of Plasma in Textiles

Concept, types of plasma and their generation, Plasma treatment of textile for water and oil repellency, Interfacial engineering of functional textiles for biomedical applications, plasma modification of wool, plasma modification of natural cellulosic fibers, characterization of plasma treated textiles.

Chapter 7. Development in Finishing

Various Low liquor and minimum application techniques in textile finishing, their advantages and limitations, wrinkle free finishing – concept of wet and moist cross linking, various eco-friendly resin finishes, Concept of UV-A and UV-B, factors affecting UV protection. Various UV- protection finishes and their evaluation, antimicrobial finishes – mode of action, factors affecting, various antimicrobial finishes.

Note: Term work for this subject will be based on above syllabus.

Reference Books

1. Handbook of Textile processing machinery by R.S. Bhagwat
2. Dyeing of polyester & its blends by Prof. M. L. Gulrajani
3. Engineering in Textile coloration by C. Duckworth
4. Norms for Textile Machinery – N.T.C.
5. Technology of Printing by Dr. V.A. Shenai
6. Technology of finishing by J.T. Marsh
7. Energy Conservation in Industries – Vol.I & II, Centre of Plant Engg. Services Hydrabad.
8. Conventional Energy Technology – By S.B. Pandya.
9. ATIRA – Circular Report June, 1988, Mill Endavours to conserve electricity by D.H. Shah, J.S. Parajia.
10. Energy Consumption & Conservation in Fibre Producing & Textile Industries – Textile Progress Vol.13, No.3.
11. Renewable Energy Resources by John Twidell.
12. Economy Energy & Environment in Textile Wet Processing by Editor S.S. Trivedi.
13. Chemical after treatments of textile by Marks, Atlas & Wooding.
14. Textile finishing by A.J. Hall.
15. Introduction to textile finishing by J.T. Marsh.
16. Technology of finishing – Vol. X by Dr. V.A. Shenai.
17. Chemical processing of polyester/cellulosic blends by R.M. Mittal and S.S. Trivedi.
18. Silk dyeing, printing and finishing by Prof. M.L. Gulrajani.

19. Garment Finishing & Care Labelling by S.S.Satsangi, Usha Publishers, 53-B/AC-IV, Shalimar Bagh, New Delhi.
20. Stain Removing Techniques by S.S.Satsangi, Usha Publishers, 53-B/AC-IV, Shalimar Bagh, New Delhi.
21. Fabric Care by Noemia D'SOUZA, New Age International Publishers, Daryaganj, New Delhi.
22. Plasma technologies for textiles by R. Shishoo

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II

ENVIRONMENTAL ENGINEERING

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter 1. Introduction to Eco System & Environment Management

Environmental problems and human health, Risk assessment and risk management, ecology and textiles, Toxicological considerations of textile processing. Definitions of environment, ecology, pollution, Types of pollution and effects on environment, general waste categorization, effective pollution prevention program

Chapter 2. Environmental Management Systems

Importance of ISO - 14000 standards, environmental policy, EMS planning, Implementation, Checking of corrective action, Concept of Okotex, GOTS.

Chapter 3. Noise Pollution in Textile Industry

Noise Pollution and its control in Textile Industry – Introduction, Noise in Textile Industry – Effect of noise on human beings – measurement of noise – methods of reducing noise.

Chapter 4. Air Pollution in Textile Industry

Classification and properties of air pollutants, Sources of emission, Green house gases, Behaviour and fate of air pollutants, Effects of air pollution on human health, vegetation, animals, machinery and building.

Sources of air pollution in wet processing, their levels, toxicity and effects on atmosphere. Air pollution laws and norms, Plume behavior, Analysis of air pollutants, Measures to control air pollution.

Chapter 5. Water Pollution in Textile Industry

Sources of water, their nature and use pattern, General types of water pollutants and their effects, Factors polluting water in textile wet processing in each unit operation like desizing, scouring, bleaching, dyeing, printing & finishing. The volume of waste generated and nature of the wastewater, Effects of wet processing effluent parameters on the environment.

Chapter 6. Effluent Treatments

Basic processes of wastewater treatment, Basic factors to be considered for waste water or effluent treatment. Methods of Treatment of Textile effluent, preliminary, primary, secondary and tertiary treatments. Advancement in the effluent treatment like reverse osmosis, plasma technology, removal of dissolved solids, removal of heavy metals. Sludge disposal, Reuse of water and cost of effluent treatment, Norms of treated effluent. A typical design for effluent treatment plant to meet the norms laid down by Pollution Control Board.

Chapter 7. Measures to reduce effluent quantity

Measures to be taken into consideration to improve the quality of the effluent generated either by chemical substitution, eco-friendly processing, process modification, etc.

Note: Term work for this subject will be based on above syllabus.

Reference Books

1. Environmental pollution control engineering – C.S. Rao.
2. Best management practices for pollution prevention in the textile industry – Textiles committee, 1997.
3. Fundamentals of air pollution – Richard W. Boubel, D. Fox et al.
4. Environmental issues – technology options for textile industry – Book of papers published by R.B. Chavan et.al of IIT, New Delhi.
5. Ecology and textiles – V.A. Shenai.
6. Treatment of textile processing effluents – N. Manivaskan.
7. Water & effluents in textile mills – P.B. Jhala et.al. ATIRA.
8. Textiles energy and waste seminar – proceedings from textile institute, 1997.
9. Economy Energy & Environment in textile Wet Processing – ACT, Edited by S.S. Trivedi.
10. Environmental Issues – Technology option for Textile Industry Edited by R. B. Chavan, Indian Journal of Fibre & Textile Research Special Issue - March, 2001.
11. Environmental Success – America Textile Industry, AATCC Symposium – 1996.
12. The Textile Industry: Achieving Our Environmental Commitment – AATCC Symposium – 1994.
13. Textile Energy & Waste Seminar – Textile Institute, 1997.

14. The Management Systems – Quality, Environment, Health & Safety ISO 9001 : 2000, ISO 14001, OHSAS 18001 BY Pranab Kr. Nag, International Certification Services.
15. Water Supplies of the Treatment and Disposal of Effluents by A.H. Little, Textile Institute Monograph series.
16. Handbook of Environments, health & safety by Herman Koren & Michael Biseri
17. Ecology and textiles by Dr. V.A. Shenai
18. Environmental issues – Technology options for textile industry – book of papers edited by Dr. R.B. Chavan

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II

HIGHTECH FIBRES-II

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Chapter – I : Characterization

Principle & working procedure of Gel permeable chromatography, DSC, TGA, DTA, DMA, Light Scattering & Ultra Centrifuge Technique.

Chapter- II : Theories of Mechanical Properties :

Reaction- Rate theory – Stress – Relaxation on Eyring's model – creep on Eyring's model. Thermodynamic equation of deformation – its application to fibres.

Chapter – III : Carbon Fibre :

Preparation – PAN based carbon fibres- Pitch based carbon fibres- Vapour grown carbon fibre – Carbon nanotubes - Structure – Surface properties – Mechanical & other physical properties. Chemical properties. Applications of carbon fibres – Carbon fibre composites.

Chapter – IV : Glass Fibre :

Introduction – Glass for fibres – Fibre manufacture – Fibre finish – Glass fibre properties – Fibre assemblies – Composites – Design of fibre glass composites.

Chapter – V : Thermally Resistant Fibres :

Introduction – Aromatic polyamides & polyimide – Semi carbon fibre – Oxidised acrylic – Polybenzimidazole (PBI), Polybenzoxazoles, PBO.

Chapter – VI : Ceramic Fibres :

Introduction – Silicon Carbide based fibres – Other non oxide fibres – Alumina based fibres – Other Poly crystalline Oxide fibres – Single crystal oxide fibres.

Chapter – VII : Aluminum Oxide Fibres :

Preparation & processes – Chemical structure – Fibre structure – Physical & Chemical properties – Applications.

Note: Term work for this subject will be based on above syllabus.

Reference Books :-

- 1) Hand Book of Fibre Science & Technology- Vol-III Part B
- 2) New Fibres – Second Edition – T. Hongu & Phillips- Wood Head Publishing Ltd., Cambridge, England.
- 3) Advanced Fibres Spinning Technology – Prof. T. Nakajima - Wood Head Publishing Ltd., Cambridge, England.
- 4) Progress in Textiles : Science Vol.-II Textile Fibres Developments & Innovations – Dr. V.K. Kothari, IAFL Publication, New Delhi.
- 5) High Speed Fibre Spinning : Science & Engineering Aspects – A. Ziavicki & H. Kawai. A Wiley Inter Science Publication.
- 6) High Performance Fibres – J.W.S. Hearle, Wood Head Publishing Ltd., Cambridge, England.
- 7) Advances in Fibre Science : Dr.S.K. Mukhopadhyay, The Textile Institute, Manchester.
- 8) Physical Properties of Textile Fibres – W.E. Morton & J.W.S. Hearle. The Textile Institute, Manchester.
- 9) Kevlar Aramid Fibres – H.Yang – John Wiley & Sons.
- 10)Mechanisms of Textile & Laminated Composites – A.E. Bogdanovich & C.M. Pastore – Chapman & Hall.
- 11)Manufactured Fibre Technology – Dr.V.B. Gupta & Dr.V.K. Kothari, Chapman & Hall.
- 12)Carbon Fibres – Jean Baptiste Donnet & Roopchand Bansal – International Fibre Science & Technology Series.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II
STATISTICS FOR TEXTILE MILL MANAGEMENT

Lectures	:	3 hrs. / Week
Assignment	:	1 hr. / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 marks

1. Multivariate data & its analysis:

Multiple and partial correlation, measures of Multiple and partial correlation, Examples for the data with three variables only.

Multiple regression, planes of regression, Examples for the data with three variables only.

2. Analysis of Variance:

One-way analysis of variance, mathematical model, ANOVA table & examples.

Two-way analysis of variance one observation per cell & with m observation per cell, Mathematical models, ANOVA tables & examples.

3. Design of Experiments:

Basic Designs: CRD & examples as one-way, RBD & examples as two-way. LSD & examples of LSD.

4. Factorial Experiments:

2^n factorial experiments: Introduction, Analysis of 2^n factorial experiments. Examples for 2^n factorial experiments.

Introduction of 3^n and higher order factorial experiments.(No examples)

Introduction of fractional factorial experiments.(No examples)

Introduction of response surface designs (No examples)

Taguchi techniques for reduction and optimization in design of experiments (No examples)

5. Linear programming Problem:

Introduction, formulation of LPP, graphical and simplex methods for finding solutions of LPP. Examples.

6. Transportation Problem:

Introduction, methods for finding initial and optimum solutions of transportation problem. Examples.

7. Assignment problem:

Introduction, method for solving assignment problem. Examples.

8. Network Analysis:

Programme Evaluation and Review Techniques(PERT): Introduction, Slack time critical path, Probability of completion of projects. Examples.

Critical path method (CPM): Introduction, Time estimates, Floats, Critical path. Examples.

Note: Term work for this subject will be based on above syllabus.

REFERENCE BOOKS:-

- 1) Modern Elementary Statistics by J. Freund.
- 2) Mathematical Statistics by J. Freund.
- 3) Probability & Statistics for engineers by Johnson.
- 4) Applied Statistics & probability for engineers by Montgomery.
- 5) Experimental Designs by Cochran & Cox.
- 6) Design of Experiments by Montgomery.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II

PROJECT PREPARATION, APPRAISAL & IMPLEMENTATION

(ELECTIVE-II)

Lectures	:	3 hrs/week
Assignment	:	1 hr/ week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

- 1) Overview – Capital expenditure, Phase of capital budgeting, Project development cycle, Objectives of investment, decision-making, Risk & return.
- 2) Identification of investment opportunities – Governmental regulatory framework – Generation & screening of project ideas – Project identifications for an existing company.
- 3) Market & demand analysis – Information required for market & demand analysis – demand forecasting methods – market planning.
- 4) Technical Analysis – Material inputs & utilities – Manufacturing process / technology – Plant capacity – location & site – structures & civil works – Machineries & equipments – Project charts & layouts – Work schedule – Need for tendering alternatives.
- 5) Financial Analysis – Cost of Project – Means of finance – Estimation of Sales & Production – Cost of production – Working capital requirement & financing – Profitability projections – Break even point – Project cost flow statements – Projected balance sheet – Multi – year projection.
- 6) Time value of money – Future value of single amount, Future value of an annuity – Present value of single amount – Present value of an annuity.

- 7) Cost of Capital – Basic concepts – Cost of debt – cost of preference capital – cost of Equity Capital – Weighted average cost of capital – Marginal cost of capital-Cost of capital for a new company.
- 8) Appraisal criteria – Urgency, Pay back period – Accounting, Debt service coverage ratio, Rate of Return, Net present value – Internal rate of return – Annual capital charge – Investment appraisal in practice.
- 9) Analysis of Risk – Types & measurement of project risk – Analytical derivation or simple estimation – Sensitivity Analysis – Scenario analysis – Selection of a project-Risk analysis in practice.
- 10) Project implementation – Forms of project organization – Project planning – project control – Human aspects of project management – Pre-requisites for successful project implementation.
- 11) Review – Initial review, performance evaluation.

Note: Term work for this subject will be based on above syllabus.

REFERENCE BOOKS :-

- 1) Textile Project Management by A. Ormerod, The Textile Institute Publication.
- 2) Goal Directed Project Management by E.S. Andersen, K.V. Grude & Tor Hang, Coopers & Cybrant Publication.
- 3) Project, Planning Analysis, Selection Implementation & Review by Prasanna Chandra, Tata McGraw Hill Publishing Co. Ltd.,
- 4) Industrial Organisation & Engg. Economics T.R. Banga & S.C. Sharma, Khanna Publishers, Delhi.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II

MANAGEMENT OF TEXTILE PRODUCTION (ELECTIVE-II)

Lectures	:	3 hrs/week
Assignment	:	1 hr/week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 marks

Indian Textile Industry: Structure, production and exports. Textile Policy. Sickness of Textile Industry- Analysis and options. Essentials of production management, production systems, classification.

Material management: Role of material management techniques, purchase management, acceptance sampling and inspection, vendor rating system, inventory management.

Production, planning and control: types of production systems and problems of planning and control, product section design, process planning, forecasting, planning of batch, mass and job shop system. Machine balancing. Layout and material handling. Machine assignment and allocation of jobs. Maintenance management: maintenance concepts, maintenance strategies, maintenance planning. Productivity and improvement techniques. Quality management: Introduction to TPM/TQM, concepts of value and quality assurance, total quality control, quality circles, ISO 9000. Marketing management: fundamental of industrial marketing, industrial buyer behaviour model.

Marketing: systems selling, role of service, marketing planning and marketing strategies, market research.

Enterprise resource planning: Role of information in managerial decision making, information needs for various levels of management, decision makers, management information system, resource monitoring and control. Product mix. Case studies.

Note: Term work for this subject will be based on above syllabus.

Reference Books

- 1) Essential of Management – by Harold Koontz & Heinz, Weihrich – Tata McGraw- Hill Publishing Company Ltd., New Delhi.

- 2) Advanced Cost & Management Accounting by P.K. Sikdar – Viva Books Pvt. Ltd., New Delhi.
- 3) Industrial Engineering & Management by O.P. Khanna & A. Sarup, Dhanapat Rai Publications (P) Ltd., Delhi.
- 4) Dynamics of Entrepreneurial Development & Management by Vasant Desai – Himalaya Publishing House – Delhi.
- 5) How to Read a Balance Sheet – An ILO Programmed Book – Oxford & IBH Publishing Co. Pvt. Ltd., Delhi.
- 6) Entrepreneurial Development by S.S. Khanta , S. chand & Company Ltd., Delhi – 110 055.
- 7) Fundamentals of Marketing by W.J. Stanton, M.J. Etzel B.J. Walker – McGraw-Hill, Inc – New York, St. Laouis etc.
- 8) Industrial Organisation & Engineering Economics by S.C. Sharma & T.R. Banga – Khanna Publishers – 2-B, Nath Market, Nai Sorak, Delhi – 110 006.
- 9) Marketing Management By Philip Kotler – Prentice – Hall of India Pvt. Ltd., New Delhi – 110 001.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-II

SEMINAR - II

Practical	:	1 hr/ week
Term Work	:	50 Marks
Subject Total	:	50 Marks

Seminar - II shall be based on tentative topic on dissertation such as review paper on some specific well defined area/specialized stream of Textile Chemistry. Each student has to prepare a write up of about 15 pages of "A4" size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department and his/her classmates. The faculty members, based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally – jointly. Some marks should be reserved for the attendance of the student in the seminars of the others students.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-III

SEMINAR - III

Practical	:	1 hr/ week
Term Work	:	50 Marks
Subject Total	:	50 Marks

Seminar – III shall be based on the work carried out for dissertation. This may cover the point right from various areas considered and analysis, the relevance feasibility and scope of work for finally selected topic, alternative solution and appropriate solution. Each student has to prepare a write up of about 20 pages of “A4” size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department and his classmates. The faculty members of the department shall do an assessment, based on the quality of the work and preparation and understanding of the candidate. Some marks should be reserved for the attendance of the student in the seminars of the others students.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-III

DISSERTATION

Practical	:	4 hrs/ week
Term Work	:	100 Marks
Subject Total	:	100 Marks

The term work under this, submitted by the student shall include –

1. Work diary maintained by the student and counter signed by his guide.
2. The contents of work diary shall reflect the efforts taken by candidate for
 - (a) Searching the suitable project work
 - (b) Visits to different factories or organizations
 - (c) Brief report of journals and various papers referred
 - (d) Brief report of web sites seen for project work
 - (e) The brief of feasibility studies carried to come to final conclusion
 - (f) Rough sketches
 - (g) Design calculation etc. etc. carried by the student.

The student has to make a presentation in front of panel of experts in addition to guide as decided by department head.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-IV

SEMINAR - IV

Practical	:	1 hr/ week
Term Work	:	50 Marks
Subject Total	:	50 Marks

Seminar – IV shall be based on the progress of the dissertation work carried out. This may cover the various practicals / survey work done. Each student has to prepare a write up of about 20 pages of “A4” size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department and his classmates. The faculty members of the department shall do an assessment, based on the quality of the work and preparation and understanding of the candidate. Some marks should be reserved for the attendance of the student in the seminars of the others students.

M.TEXT.(TEXTILE CHEMISTRY) SEMESTER-IV

DISSERTATION

Practical	:	4 hrs/ week
Term Work	:	50 Marks
Oral Exam.	:	200 Marks
Subject Total	:	250 Marks

The dissertation submitted by the student on topic already approved by university authorities on the basis of initial synopsis submitted by the candidate shall be according to following guidelines – Format of dissertation report – The dissertation work report shall be typed with double space on A4 bond paper. The total number of pages shall not be more than 150 and not less than 60. Figures, graphs, annexures etc. be added as per requirement. The report should be written in the following format.

1. Title page
2. Certificate
3. Acknowledgement
4. Index
5. Abstract
6. Introduction
7. Literature survey
8. Plan of work
9. Results and discussions
10. Conclusions
11. References
12. Annexure

D.K.T.E.SOCIETY'S TEXTILE & ENGINEERING INSTITUTE, ICHALKARANJI.**Equivalence of subject at M.Text. to Revised M.Text. Course.****M.TEXT.- T.C. (TEXTILE CHEMISTRY) SEMESTER-I**

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(TC)	Advanced Textile Chemical Processing-I	I	Advanced Textile Chemical Processing-I	I
2.	M.Text.(TC)	Hightech Fibres-I	I	Hightech Fibres-I	I
3.	M.Text.(TC)	Advanced Computer Applications in Textiles	I	Advanced Computer Applications in Textiles	I
4.	M.Text.(TC)	Physical Methods of Analysis & Eco-Testing	I	(Elective-I)Physical Methods of Analysis & Eco-Testing	I
5.	M.Text.(TC)	----	--	Elective-I	I
6	M.Text. (TC)	Seminar-I	I	Seminar-I	I

M.TEXT.- T.C. (TEXTILE CHEMISTRY) SEMESTER-II

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(TC)	Advanced Textile Chemical Processing-II	II	Advanced Textile Chemical Processing-II	II
2.	M.Text.(TC)	Environmental Engineering	II	Environmental Engineering	II
3.	M.Text.(TC)	Hightech Fibres-II	II	Hightech Fibres-II	II
4.	M.Text. (TC)	Statistics & Design of Experiments	II	Statistics for Textile Mill	II

				Management	
5.	M.Text.(TC)	Project Preparation, Appraisal & Implementation	II	Elective-II (Project Preparation, Appraisal & Implementation)	II
6.	M.Text.(TC)	Seminar-II	II	Seminar-II	II

M.TEXT.- T.T. (TEXTILE CHEMISTRY) SEMESTER-III

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(TC)	Seminar-III	III	Seminar-III	III
2.	M.Text.(TC)	Dissertation	III	Dissertation	III

M.TEXT.- T.C. (TEXTILE CHEMISTRY) SEMESTER-IV

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(TC)	Seminar-IV	IV	Seminar-IV	IV

2.	M.Text.(TC)	Dissertation	IV	Dissertation	IV
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