

M.TEXT (TECHNICAL TEXTILES) SEMESTER I W.E.F JULY 2016										
SR.NO	SUBJECTS	TEACHING HOURS WEEK				EXAMINATION SCHEME				
		L	PR	A	TOTAL	TH	TW	OE	TOTAL	
1	ADVANCES IN FABRIC STRUCTURE AND ENGINEERING-I	3	--	1	4	100	50	----	150	
2	INDUSTRIAL APPLICATIONS OF TEXTILES-I	3	--	1	4	100	50	----	150	
3	TEXTILES FOR PROTECTION	3	--	1	4	100	50	----	150	
4	ADVANCED COMPUTER PROGRAMMING AND APPLICATIONS	3	--	1	4	100	50	----	150	
5	ELECTIVE-I	3		1	4	100	50	----	150	
6	SEMINAR-I	----	1	----	1	----	50	----	50	
	TOTAL	15	1	5	21	500	300	----	800	

Elective-I

- 1)BUILDTECH & AGROTECH**
- 2)TEXTILES IN SPORTS**
- 3) SMART TEXTILES**
- 4) FUNCTIONAL & HIGH PERFORMANCE FIBRES**

M.TEXT (TECHNICAL TEXTILES)		SEMESTER II				W.E.F JULY 2016			
SR. NO.	SUBJECTS	TEACHING HOURS/WEEK				EXAMINATION SCHEME			
		L	PR	A	TOTAL	TH	TW	OE	TOTAL
1	ADVANCES IN FABRIC STRUCTURE AND ENGINEERING-II	3	----	1	4	100	50	----	150
2	INDUSTRIAL APPLICATIONS OF TEXTILES-II	3	----	1	4	100	50	----	150
3	SURFACE TREATMENTS FOR TECHNICAL TEXTILES	3	----	1	4	100	50	----	150
4	DESIGN OF EXPERIMENTS & STATISTICAL APPLICATIONS IN TEXTILES	3	----	1	4	100	50	----	150
5	ELECTIVE -II	3	----	1	4	100	50	----	150
6	SEMINAR-II	----	1	----	1	----	50	----	50
	TOTAL	15	1	5	21	500	300	---	800

- Elective II-
- 1) PRODUCT DESIGN AND DEVELOPMENT IN TECHNICAL TEXTILES
 - 2) NON WOVEN TECHNOLOGY
 - 3) RECYCLING OF TEXTILES
 - 4) PROJECT PREPARATION, APPRAISAL & IMPLEMENTATION

M.TEXT (TECHNICAL TEXTILES) SEMESTER III W.E.F JULY 2016										
SR.NO.	SUBJECTS	TEACHING HOURS/WEEK				EXAMINATION SCHEME				
		L	PR	A	TOTAL	TH	TW	OE	TOTAL	
1	SEMINAR-III	----	1	----	1	----	50	----	50	
2	DISSERTATION		4	----	4	----	100	---	100	
	TOTAL	--	5	--	5	---	150	----	150	

M.TEXT (TECHNICAL TEXTILES) SEMESTER IV W.E.F JULY 2016										
SR. NO.	SUBJECTS	TEACHING HOURS /WEEK				EXAMINATION SCHEME				
		L	PR	A	TOTAL	TH	TW	OE	TOTAL	
1	SEMINAR-IV	----	1	----	1	----	50	----	50	
2	DISSERTATION	----	4	----	4	----	50	200	250	
	TOTAL	----	5	----	5	----	100	200	300	

TEACHING---

L → LECTURES
 PR → PRACTICALS
 A → ASSIGNMENTS

EXAMINATION

TH → THEORY PAPER MARKS
 TW → TERM WORK MARKS
 OE → ORAL EXAM. MARKS

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I

1. ADVANCES IN FABRIC STRUCTURE AND ENGINEERING-I

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

PART I: WOVEN FABRIC

1. Geometrical modeling of woven fabric structure

Introduction: woven fabric structure, A simple geometric model of woven fabric structure, Using the model to predict the fabric thickness, cover, mass and specific volume, Modeling maximum fabric cover, Calculating fabric properties: numerical examples

2. Using a geometric model to predict woven fabric properties

Introduction, Predicting woven fabric parameters, predicting the weavability limit, Predicting cover in different woven structures, Calculating fabric properties: numerical examples, Application: calculating tightness values

3. Woven fabric properties after structural modifications

Introduction, Crimp interchange phenomena, Maximum fabric extension, other structural changes, Structural design of woven fabrics using soft computing, Calculating fabric properties: numerical examples

4. Design and engineering of woven fabrics: Textile product design methods

Introduction, The design process for textiles, Traditional design methods, Key issues in the design of textile products, Computer-assisted design (CAD) of woven fabrics, Design engineering using modeling, Reverse engineering, Expert systems in textile product design

5. Modeling for woven fabric design

Introduction, Types of computer modeling in fabric design and manufacture, The application of modeling to woven fabric design, Modeling structure–property

relationships: elongation and bending, Modeling of woven fabric texture, Limitations of modeling

6. Modeling three-dimensional (3-D) woven fabric structures

Introduction: 3-D fabrics, 2D and 3-D fabric weaving, Classifying 3-D woven fabrics, Modeling equations for weaving 2-D and 3-D fabrics, The use of 2-D and 3-D textiles in composites, The tensile properties of 3-D textile composites, non crimped fabrics(NCF)

PART II: KNITTED FABRIC

1. Modelling of knitting

Introduction, Knitted fabric geometry, Mechanics of knitted fabric: 2D model, Mechanics of plain-weft knitted fabrics: 3D model, Knitted fabric mechanics: energy model, Knitted fabric pressure on a surface, Heat and water vapour diffusion in fabrics

2. Advances in knitting: Intelligent yarn delivery systems in weft knitting

Introduction, Theory of yarn delivery, Yarn storage and delivery systems on circular knitting machines, Yarn storage and delivery systems on flat knitting machines

3. Advances in warp knitted fabric production

Introduction, Commercial warp knit machines, Delaware stitch and modified Delaware stitch tricot fabrics, Tricot and Raschel containing spandex, Key Raschel fabrics containing spandex, Newly developed constructions with spandex, Americana and modified Americana tricots, Surface interest fabrics, Milanese fabrics, Spacer fabric production and properties

4. Knitted fabric composites

Introduction, Types of fibre and yarn used in knitted fabric composites, Composite performs, Knit structures for fabric composites, Types of matrix materials, Developments in manufacturing methods for knitted fabric composites, Mechanical properties, Applications

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Woven textile structure: Theory and applications, B. K. Behera and P. K. Hari
2. Advances in knitting technology, Edited by K. F. Au
3. Woven Fabric Structure : Design and Product Planning, J. Hayavadana

4. Soft computing in textile engineering, Edited by A. Majumdar

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I

2. INDUSTRIAL APPLICATION OF TEXTILES-I

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

1. **Textiles for Construction:** Importance of buildtech with respect to technical textiles, Requirements of buildtech, study of structure and properties of high performance textile structures in relation to requirements of buildtech. Applications like Fabrics for Architecture and Construction, Applications of Coated Fabrics in Building Structures, Awnings and Canopies, Textiles as Roofing Materials, Storage Vessels, Fibre Reinforced Concrete and Cements, Textiles for Acoustic and heat Insulation
2. **Textiles for filtration:** Introduction, importance of filtration, Principles and mechanism of Filtration, requirements of filtration, Filtration Equipments, Textile in Dry Filtration, Textile in Liquid Filtration, Designing for Filtration, Testing and evaluation of performance. Application and developments in filtration fabrics.
3. **Textiles for military and defense:** Introduction, Applications of various textile structure in protective Clothing and Individual Equipment, Textiles Used in Defense Systems and Weapons, Testing and evaluation of various textile structures used in defense and military applications.
4. **Textiles in transportation:** Introduction, Manufacturing process, structure and properties of Tyre cord fabrics, Airbags, Seat Belts, Automotive Interior Trim, Automotive Exterior Trim, Truck and Car Covers, Hoses and Filters in Cars. Textile for Aircrafts, Textiles as structural Elements in Transport Vehicles, Inflatable

Products Used in Transportation. Testing and evaluation techniques of above products.

5. **Miscellaneous industrial applications of textiles:** Textiles in Agriculture, Electronics. Textiles for Banners and Flags. Textile Reinforced Products ,Transport Bags and Sheets, Fabrics to Control Oil Spills, Canvas Covers and Tarpaulins, Ropes and Nets, Home and Office Furnishings, Testing and evaluation techniques of all these products.
6. **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. Applications of coated materials.
7. **Phase changing materials:** Concept of Phase Change Materials, Mode of action of Phase Change materials, Application of Phase Change Materials.
8. **Shape memory polymers:** Concepts associated with shape memory materials, principle of temperature dependant shape memory polymers, Application and prospects for shape memory polymers. Shape memory fibres, role of smart materials in textiles, shape memory material in smart fabrics and garments.
9. **Nano fibers :** Various Methods of manufacturing of nano-fibres, properties and application of nano fibres

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

- 1) Wellington Sears Handbook of Industrial Textiles by Sabit Adanur.
- 2) Handbook of Technical Textiles by A.R. Horrocks.
- 3) Military Textiles by E. Wilusz.
- 4) Textiles in Automotive Engineering by W. Fung & M. Hardcastle.
- 5) Textiles for Protection by R.A. Scott.
- 6) Fibre-Reinforced Composites by P.K. Mallick.
- 7) 3-D Textile Reinforcements in composite materials by A. Miravate.

- 8) Coated Textiles Principles and Applications by Dr. A. K. Sen
- 9) Shape memory polymers and Textiles by Jinlian HU
- 10) Nanofibres & Nanotechnology in Textiles by P.J. Brown & K. Stevens

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I

3. TEXTILES FOR PROTECTION

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

1. Overview of protective clothing: Overview and various standards for protective clothing, Market prospects, Classification, Materials and technologies, Future of personal protection, Requirements, International standards, Certification, Future trends.

2. Factors affecting the design and use of protective clothing: Introduction, Factors influencing the design development process, Clothing systems and functionality, Reconciling fashion and function, Future trends, Recommended steps in the selection of textiles for protective clothing, Relevant standards, specifications or guidelines, Protection performance of materials, Biological protection performance, Flame and thermal protection performance, Mechanical protection performance, Selection of materials based on other major factors,

3. Protection against hazard: Introduction, Types of hazards, Mechanical hazards, Pressure hazards, Environmental and fire hazards, Chemical and biological hazards, Electrical and radiation hazards

4. Intelligent textiles and surface treatments for textiles: Smart textiles, Applications of smart textiles for protective purposes, Sensor function, Data processing, Actuators, Energy, Communication, Thermal protection, Electric actuation, Types of surface

treatments, Early treatments for protective textiles, Progression to modern treatments, Choice of treatments in relation to fibre and fabric types, Treatment process fundamentals, Treatment application systems, Brief overview of finishes for protection.

5. Interactions between protection and thermal comfort :Introduction, Definition of comfort, Test methods for heat and moisture transfer, Measurement of thermal comfort with practice-related tests, Interactions between heat and mass transfer, Moisture storage and influences on protection, Thermal manikins, Measuring the insulation of protective clothing systems, Measuring the evaporative resistance of protective clothing systems, Ensemble data, Moving manikins, Manikin tests vs fabric tests, Using manikins under transient conditions.

6. General protection requirements and applications: Civilian protection and protection of industrial workers from chemicals, Textiles for UV protection, Textiles for protection against cold, Thermal (heat and fire) protection, Microorganism protection, Textiles for respiratory protection. Electrostatic protection, Ballistic protection, Military protection, Fire fighters protective clothing, Protection against knives and other weapons, Flight suits for military aviators, Protection for workers in the oil and gas industry, Motorcyclists

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Handbook of Fibre Science & Technology Vol-III Part –B.
2. New Fibres Second Edition by T. Hongu & Phillips.
3. Advanced Fibres Spinning Technology by T. Nakajima.
4. High Performance Fibres by J.W.S. Hearle.
5. Advances in Fibre Science by Dr. S.K. Mukhopadhyay.
6. Kevlar Aramid Fibres by H.Yang.
7. Textiles for Protection by R.A. Scott.
8. Fire Retardant Materials by A.R. Horrocks & D. Price.
9. Wellington Sears Handbook of Industrial Textiles by Sabit Adanur.

10. Intelligent Textiles & Clothing by H.R. Mattila.

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I

4. ADVANCED COMPUTER PROGRAMMING AND APPLICATIONS

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

Unit-I

Object-oriented Programming using C++

Introduction to object oriented programming, basic program construction, variable types, loops & decisions, structures, functions, objects & classes, arrays, polymorphism, operator overloading, function overloading, inheritance

Unit-II

Relational Databases

Relational Model, Database Users, Roles of Database Administrator, keys, Domain Constraints, Referential Integrity, Structured Query Language (SQL), Database recovery methods

Unit-III

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

Unit-IV

ERP and Its Related Technologies

Introduction to ERP, Basic ERP concepts, Justifying ERP Investments, RISK of ERP, Benefits of ERP. ERP and Related Technologies, Business Process Reengineering (BPR), Product Life Cycle Management, Supply Chain Management (SCM), Customer Relationship Management (CRM). Use of ERP in Textile Industry.

Unit-V

SAP

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

Unit-VI

Business Intelligence System

Technical Architecture overview, Back room Architecture, Presentation Server Architecture, Front room Architecture, Metadata, Standard Reports, Dashboards and Scorecards

REFERENCE BOOKS :-

- 1) Object Oriented Programming with C++ - E. Balagurusamy.
- 2) Database System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.)
- 3) E-Commerce – David Whiteley, TmH.
- 4) ERP Demystified - Alexis Leon, TMH
- 5) Enterprise Resource Planning – Alexis Leon, TMH.
- 6) SAP R/3 SAP Architecture, Administration, Basis, ABAP Programming with MM and SD Modules – Dreamtech Press
- 7) The Data Warehouse Lifecycle Toolkit By Ralph Kimball, Ross, 2nd edition, Wiley Publication.

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I

5. FUNCTIONAL & HIGH PERFORMANCE FIBRES (ELECTIVES –I)

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

- I) Introduction to High Performance Fibres.
- II) Aramids: - Manufacturing, properties of fibres, and applications.
- III) Gel spun high performance polyethylene fibres:-Manufacture, fibre characteristics and applications,
- IV) Carbon Fibres: Introduction, PAN and pitch based carbon fibres, physical properties and applications.
- V) Glass Fibres: fibre manufacture, properties and Applications
- VI) Ceramic Fibres: Introduction, silicon carbide based fibres, Alumina based fibres. Single crystal oxide fibres.
- VII) Chemical resistant fibres and thermally resistant fibres: Chlorinated fibres: PVDC, Fluorinated Fibres: PTFE, PVF, PVDF & FEP, Poly (etheretherketones): PEEK, Poly (phenylene sulphide): PPS, Poly (ether imide) : PEI, semi-carbon fibres: oxidized acrylic, poly benzimidazole, PBI Polybenzoxazoles, PBO.

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

REFERENCE BOOKS

1. High Performance Fibres by J. W. S. Hearle
2. Carbon Fibres by Donnet & Bansal
3. Hand book of Fibres Science & Technology : High Technology Fibres edited by Manachem Lewin & Jack Preston
4. New Fibres by Hongu and Phillips.
5. Kevlar Aramid Fibres by yang.

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I, ELECTIVE I

5. BUILD TECH AND AGRO TECH

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

PART I: BUILDTECH

1. **Textiles for Construction:** Importance of buildtech with respect to technical textiles, Requirements of buildtech, study of structure and properties of high performance textile structures in relation to requirements of buildtech. Applications like Fabrics for Architecture and Construction, Applications of Coated Fabrics in Building Structures, Awnings and Canopies, Textiles as Roofing Materials, Storage Vessels, Fibre Reinforced Concrete and Cements, Textiles for Acoustic and heat Insulation
2. **Textile structures:** Introduction, Planar (2D) textile structures, Three-dimensional (3D) textile structures, directionally oriented structures (DOS), Hybrid structures
3. **Natural fiber reinforced concrete:** Introduction, Fiber characteristics and properties, Matrix characteristics, Properties, Durability

4. Fibrous materials based composites for civil engineering applications:

Fibrous materials reinforced composites production techniques: Introduction, Organic matrices, Fibers, Production techniques: general characteristics, Processing: materials and parameters, Strengthening of structures, Properties of composite material laminates

5. Fibrous materials reinforced composites for structural health monitoring:

Introduction, Materials and systems: hardware and software, Applications, Future trends

6. Fibrous materials as a concrete reinforcement material:

Steel fibre reinforced concrete: Material properties and structural applications : Introduction, The fundamentals of fibre reinforcement effectiveness, Mix design and steel fibre reinforced self-compacting, concrete (SFRSCC) compositions, Fibre pullout, Characterization of the mechanical properties, Structural behavior, FEM models for the analysis of laminar SFRC structures, Possibilities of steel-fibre reinforced concrete (SFRC) for underground structures

7. Innovative building materials:

Fibrous insulation materials in building engineering applications, Acoustic behaviour of fibrous materials, The use of textile materials for architectural membranes

PART II: AGROTECH

History of Agro Textile ,Market prospectus of agro textiles,Need of agro textiles,Fibers used for Agro Textiles,Properties Required for Agro-Textiles,Manufacturing Processes of Agro-Textiles,Advantages & Disadvanges of Agro-Textiles,Applications of Agro-Textiles: Agro-textiles for production of crops, Agro-textiles for Horticulture & Floriculture, Agro-textile for Animal Husbandry, Fishing and aquaculture nets etc,Techno-economics of Agro textiles

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Fibrous and composite materials for civil engineering applications, Edited by R. Fanguero
2. Handbook of Technical Textiles by A.R. Horrocks and S. C. Anand
3. Coated Textiles Principles and Applications by Dr. A. K. Sen
4. Wellington Sear's Hand book of Industrial Textile by Rd. Sabit Adnur.
5. www.technicaltextiles.net
6. www.textileworld.com/textile-world/.../agrotextiles-a-growing-field/
7. textilelearner.blogspot.com/2012/02/agro-textiles-general-property.htm
8. <http://www.textilemedia.com/technical-textiles/new-textile-materials/agrotextiles/>
9. http://www.textileworld.com/Issues/2005/September/Nonwovens-Technical_Textiles/Agrotextiles-A_Growing_Field
10. <http://www.fibre2fashion.com/industry-article/textile-industry-articles/agro-textiles-a-rising-wave>
11. <http://www.indiantextilejournal.com/articles>
12. Book: Agro-textile Products & Their Usage By- Mrs. Manisha A. Hira Scientist
C Sasmira, Mumbai
13. Handbook of Agro textiles: www.technotex.gov.in

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I (ELECTIVE-I)

5. TEXTILE IN SPORTS

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

1. Key trends in sportswear design

Introduction, Market overview, Future market trends, the evolution of performance underwear; the rise of all-in-one suits; seamless garments; three-dimensional modeling; stitch less seams; the influence of advances made in laminating, The evolution of layering: the reorganization of the three-layer system; the soft shell; air: a key raw material, External influences: interactions between fashion and sportswear; wearable technology, Future trends: streamlining or stealth design.

2. Material requirements for the design performance of sportswear

Introduction: the link between textile technology and the demands of the end-user, Identifying the needs of the end-user: developments in sport specific clothing from post war to the present day: the layering system; from walking to mountaineering; point of sale promotional material; synthetic fibres and fabrics; commercialization of sport;

technical sportswear for women; trend; style; fashion; fibre branding; garment development. The design development process: the application of technical textiles in performance sportswear; functional needs of the end-user; the needs of the body; the demands of the sport, Form and style considerations, the demands of the culture; the demands of style and fashion, Emerging trends: commercial reality; smart clothes and wearable technology, biomimicry, environmental-issues.

3. Functional sport footwear

Introduction, Functional design of sport footwear, Functional fit of sport footwear: biomechanics of the foot; fitting areas of the shoe: flexing point; heel; toe and arch; heel-to-joint and shock absorbency; shape of the last; fastening systems; shoe size systems, Functional materials and components in sport footwear: properties of materials and components; materials for sport footwear of upper sole, Future trends in functional footwear, High-functional textiles: hydrophobic surface; dirt and oil repellence; hydrophilic finishing; UV-protection; flame retardance, antistatic finishing; antimicrobial finishing; reduction of shrinkage; softening; coating and membranes

4. Coated and laminated textiles in sportswear

Introduction, Sports products from coated and laminated fabrics: protective sportswear and comfort; other sports products

5. Sportswear and comfort: Physiological comfort of sportswear:

Introduction, Aspects of wear comfort, Measurement of physiological comfort, wear comfort as a measurable quantity; wearer trials; skin model; skin sensorial test apparatus; wear comfort vote applications

6. Elastic textiles

Manufacturing of Elastic textiles for sports wear

7. Protection against impact using clothing and personal equipment

Introduction, Analysis of injury sustained during sporting activities
Impact protection provided through protective clothing/equipment: general principles; effectiveness of impact protection in selected sporting codes
Effects of protective clothing/equipment on human performance; guidelines; codes of practice

8. Water resistance and water vapour transfer

Introduction, Water resistance, Water vapor transfer: performance and protection under steady state conditions; performance and protection under windy conditions; performance and protection under rainy conditions; performance and protection under wind driven rainy conditions, The condensation problem in waterproof breathable fabrics for sportswear

9. Textile use in sports shoes

Introduction: Current use of textiles in sport shoes: uppers; textiles in the sole

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

- 1) Wellington Sears Handbook of Industrial Textiles by Sabit Adanur.
- 2) High Performance Fibres J.W.S. Hearle.
- 3) Advances in Fibre Science by S.K. Mukhopadhyay
- 4) New Fibres by T. Hongu & G.O. Phillips.
- 5) Handbook of Technical Textiles by A.R. Hoorocks & S.C. Anand.
- 6) New Millennium Fibres by G.O. Phillips & T. Hongu.
- 7) Smart Textiles for Medicine & healthcare b L.Van Langenhove.
- 8) Synthetic Fibres, Nylon, Polyester, Acrylic & Polydefin by J.E. McIntyre.
- 9) Composite Materials: Engineering & Science by F.L. Matthews & R.D. Rawlings.
- 10) Textiles for Protection by R.A. Scott.
- 11) Coated Textiles by A.K. Sen
- 12) Materials in Sports Equipments by Subic.

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - I (ELECTIVE-I)

5. SMART TEXTILES

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

1. General introduction:

Definition, classification, intelligent systems and general applications.

2. Modeling of intelligent materials: Background, underpinnings of interdisciplinary, scientific practices and research strategies for intelligent garments

3. Phase change materials: Heat balance and thermo-physiological comfort, Phase change technology, PCM in textiles, Future prospects of PCM in textiles and clothing

4. Intelligent textiles with PCMs: Basic information of phase change materials, Phase change properties of linear alkyl hydrocarbons, Textiles containing PCM, Measurement

of thermo regulating properties of fabrics with micro PCMs

5. Shape memory polymer: Introduction to shape memory polymer, Shape memory alloys, Shape memory ceramics, Magnetic shape memory materials, Shape memory polymers and gels, Future prospects of shape memory materials

6. Temperature sensitive shape memory polymers : A concept of smart materials, Shape memory polymer and smart materials, Some examples of shape memory polymer for textile applications, Potential use of shape memory polymer in smart textile, General field of application, Challenges and opportunities

7. Study of shape memory polymer films for breathable textiles: Breathability and clothing comfort, Breathable fabrics, Water vapor permeability (WVP) through shape memory polyurethane

8. Chromic and conductive materials: Photo chromic materials, Thermochromic materials, Colour changing, Electro chromic materials

9. Solar textiles: production and distribution of electricity coming from solar radiation: Solar cells, Textiles as substrates, Technological specifications, Challenges to be met, Suitable textile constructions,

10. Introduction to conductive materials: Electric conductivity, Metal conductors, Ionic conductors, inherently conducting polymers, Application technologies for conducting fibre materials

11. Multipurpose textile based sensors: Introduction, Conductive polymer textile sensors, Conductive polymer composites (CPCs) textile sensors

12. Textile micro system technology: Textile micro system technology, Textiles are inherent microstructures, Textile-based compliant mechanisms in micro-engineering and mechatronics

13. Applications:

Intelligent textiles for medical and monitoring applications

Context aware textiles for wearable health assistants

Intelligent garments in prehospital emergency care

Intelligent textiles for children

Wearable biofeedback systems

Applications for woven electrical fabrics

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Smart fibres, fabrics and clothing edited by Xiaoming Tao, Wood head publishing Ltd., England.
2. Intelligent Textile and clothing edited by H. R. Mattila, Wood head Publishing, England.
3. Clothing bisensory Engineering edited by Y. L. and A. S. W Wang, Wood head publishing Ltd. England.
4. Analytical electro chemistry in textiles P. Westbrook, G. Priniotakis and P.Kienkens, wood head publishing Ltd, England

M.TEXT.(TECHNICAL TEXTILE) 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 technical textiles (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. (TECHNICAL TEXTILES) SEMESTER - II

1. ADVANCES IN FABRIC STRUCTURE AND ENGINEERING-II

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

PART I: NON WOVEN FABRIC

1. Market size and scope of non wovens

2. The influence of fiber and fabric properties on nonwoven performance

Influence of solidity or packing density (α), and porosity (ϵ) on nonwoven performance, Experimentally calculated pore size of nonwovens, Pore size distribution, Experimentally calculated fiber size of nonwovens, Theoretically calculated pore size,

air permeability, pressure drop and filtration efficiency, Influence of thermal insulating properties on nonwoven performance, Influence of filtration efficiency (FE) on nonwoven performance, Influence of mechanical properties on nonwoven performance

3. Biodegradable materials for nonwovens

Reasons for using biodegradable nonwovens, Cotton, hemp and other natural fibres, Cotton and flax-based nonwovens, Nonwovens from animal fibres, Technologies for biodegradable nonwovens, Applications of biodegradable nonwovens

4. Computer programs for measuring nonwoven performance Characterization, testing and modelling of nonwoven fabrics

Introduction: characterization of nonwoven fabrics, Characterization of fabric bond structure, Fabric weight, thickness, density and other structural parameters, General standards for testing nonwovens, Measurement of basic parameters, Measuring fibre orientation distribution, Measuring porosity, pore size and pore size distribution, Measuring tensile properties, Measuring gas and liquid permeability, Measuring water vapour transmission, Measuring wetting and liquid absorption, Measuring thermal conductivity and insulation, Modelling pore size and pore size distribution, Modelling tensile strength, Modelling bending rigidity, Modelling specific permeability, Modelling absorbency and liquid retention, Modelling capillary wicking, Modelling thermal resistance and thermal conductivity, Modelling acoustic impedance, Modelling filtration properties, The influence of fibre orientation distribution on the properties of thermal bonded nonwoven fabrics

5. INDA & EDANA Standards

6. Applications of Nonwovens in Technical Textiles

PART II: BRAIDED TECHNOLOGY FOR TEXTILES

1. Introduction

2. The mechanics of the braiding process: Braiding point parameters, Forces on the braid building yarn segment, Relationship between take-off velocity and braiding angle, Braid tension variances during tubular braiding and over braiding, Influence of the braiding needles over the braiding process of flat braids, Bobbin winding tension and the braiding process, Braiding tension influences over the braided product, Control of the yarn tension in the braid former

3. Computer assisted design (CAD) software for the design of braided structures:

Introduction, Colour design of braided structures, 3D geometrical models, Custom machine configurator, Calculations for braiding 331

4. Manufacturing Technology and Technical specifications of Braided Biaxial fabric,

Braided Triaxial Fabric, Braided Unidirectional Fabric, Braided Tapes & Wide Braided Fabrics

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Applications of nonwovens in technical textiles, Edited by R. A. Chapman
2. Nonwoven Process Performance & Testing – Turbak
3. Proceedings of the Seminar - Nonwoven Technology Market & Product Potential, IIT, New Delhi December 2006.
4. Handbook of nonwovens, Edited by S. J. Russell, Wood head Publishing, CRC Press, Washington DC, 2007
5. W.Albrecht, H. Fuchs and W.Kettelmann, Nonwoven Fabrics: Raw Materials, Manufacture, Applications, Characteristics, Testing Process, Wiley-VCH, Verlag GmbH & Co.KGaA, Weinheim, 2003.
6. M.S. Casper, Nonwoven Textiles, Noyes Data Corp.(Park Ridge, N.J), 1975.
7. M. McDonald, Nonwoven Fabric Technology, Park Ridge, NJ: Noyes Data, 1971
8. Braiding Technology for Textiles, Y. Kyosev
9. <http://www.braider.com/>

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - II

2. INDUSTRIAL APPLICATIONS OF TEXTILES-II

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

UNIT I: MEDICAL TEXTILES

1. General introduction:

Definition and classification of medical textiles.

2. Biomaterials utilized in medical textiles:

Natural carbohydrate polymers, Modified carbohydrate polymers, Natural and modified proteins, Commercial applications and products using carbohydrate polymers. Reformed collagen fibres, Novel Chitosan-alginate fibres for advanced wound dressings.

3. Healthcare and hygiene products

Superabsorbent fibres, Antimicrobial fibres, Disposable products, Operating room garments, Application of nonwovens in healthcare and hygiene sector, Absorbent hygiene products, Material used in nonwoven products available in the market

4. Infection control and barrier materials

Infection control and barrier materials, The use of dye-like interactions for developing novel infection-resistant materials, The use of Amcor Pure technology in medical textiles for qualitative evaluation of the barrier effect of textiles, Reducing microbial contamination in hospital blankets.

5. Bandaging and pressure garments

Compression therapy for venous leg ulcers treatment, A comparison of elastic and non-elastic compression bandages for venous leg ulcer treatment, The theory of the Laplace Law, Laplace Law to predict pressures exerted by pressure garments, Evaluation of pressure profile of bandages using mannequin legs

6. Implantable devices:

A spider silk supportive matrix used for cartilage regeneration, Third generation scaffolds for tissue engineering.

UNIT II: FIBRE REINFORCED COMPOSITES (FRC)

1. General introduction

Meaning and types of composite materials, design of composite materials, the concept of load transfer.

2. Fibers and matrices

Reinforcements: carbon fibers, glass fibers, organic fibers, silicon carbide, Strength of reinforcements: thermal stability, compressive strength, fiber fracture and flexibility

Matrices: polymer matrices, metal matrices, ceramic matrices.

3. Fiber architecture:

Volume fraction and weight fraction, fiber packing arrangements, clustering of fibers and particles.

4. Fabrication:

Liquid resin impregnation routes, pressurized consolidation of resin prepregs, injection mouldings of thermoplastics, hot press mouldings of thermoplastics,

5. The interface region:

Bonding mechanisms: absorption and wetting, inter diffusion and chemical reaction, electrostatic attraction, mechanical keying, residual stresses.

6. Bond strength:

Measurements of bond strength: single fiber pull out strength, single fiber push out and push down strength.

7. Control of bond strength: coupling agents and environmental effects, toughness reducing coatings, interfacial chemical reaction and diffusion barrier coatings.

8. Strength of composites:

Failure mode of long fibers like axial tensile failure, transverse tensile failure, shear failure, failure in compression, Basic concepts of fracture mechanics, interfacial fracture and crack deflection.

9. Thermal behavior of composites: Thermal stresses and strains, thermal expansivities, thermal cycling of unidirectional composites, thermal cycling of laminates, Thermal conduction mechanism like heat transfer, conductivity of composites and interfacial thermal resistance.

10. Applications: minesweeper hull, sheet processing rolls, helicopter rotor blade, and golf driving club, racing bicycle, diesel engine piston, microelectronics housing, aircraft brakes and gas turbine combustor can.

UNIT III: TEXTILES IN AUTOMOBILE ENGINEERING

1. Fabric structures and production methods for Automobile textiles: wovens, warp knitted & non-wovens.

2. Yarn and fabric processing: Introduction, dyeing and finishing, Printing, Coating and lamination,

3. Quality assurance and testing for Automotive textiles: Quality assurance, Test method details,

4. Textiles in other forms of transportation

Flame retardancy, Fabric coating, Textiles in other road vehicles, Railway applications, Marine applications, Textiles in aircraft

5. Other textile applications

Seat belts 228, Airbags, Carpets, Cabin air filters, Battery separators

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Fabre reinforced composites by P. K. Mallick
2. Composite materials: Engineering & science by F. L. Mathew & R. D. Rawlings.
3. Microstructural Characterization of fibre reinforced composites by John Summer scales.
4. Introduction to composite materials, Clyne and Hull
5. Medical Textiles & Biomaterial for Healthcare by S.C. Anand, M.M. Traftab, S. Rajendra – Woodhead Publication
6. Advance Textile for Wound Care – by S. Rajendra - Woodhead Publication
7. Medical Textiles 2007 : Proceedings of the fourth international conference on Health card & medical textile – by J.F. Kennedy, S.C. Anand & F. Miraftab.
8. Medical Textile: Proceeding of the Second International Conference & Exhibition by S.C. Anand: CRC Publication.
9. Wellington Sears Handbook of Industrial Textiles by Sabit Adanur.
10. Hand book of Technical Textiles by A. R. Horrocks.
11. Textiles in automotive engineering by W. Fung.
12. Composite materials: Engineering & Science by F. L. Matthews & R. D. Rawlings.
13. Automotive textiles by Textile progress Vol. 29 by S. K. Mukhopadhyay.

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - II

3. SURFACE TREATMENTS FOR TECHNICAL TEXTILES

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

Subject Total : 150 Marks

PART I: NANOTECHNOLOGY FOR TEXTILES

1. Introduction to Nanotechnology: Concept of nanoscale and Historical background of nanotechnology, Fundamental concepts of nanotechnology - Bottom-up approaches, Top-down approaches, Functional approaches.

2. Synthesis and Properties of Nanoparticles: Synthesis of Fullerenes and various forms of carbon. Synthesis of nano metal particles by various chemical, physical and biological methods. Properties of nano particles like organic and inorganic materials in various chemical forms.

3. Characterization of Nanoparticles: X-Ray Diffraction, Transmission Electron Microscopy and Spectroscopy; Scanning electron microscopy (SEM); Transmission electron microscopy (TEM); Energy-dispersive x-ray spectroscopy (EDS), Small-Angle X-Ray Scattering (SAXS), The Cone Calorimeter (CC), The Mass Loss Calorimeter (MLC).

4. Nanocomposites: Carbon nanotube / nanofibre polymer composites, development of functional polymer nanocomposites, Nano filled polypropylene nanocomposites and Dyeable PP.

5. Nanoengineered Textiles : Conductive textiles, Antimicrobial textiles, Self cleaning textiles, Moisture absorbing textiles, Improved hydrophilicity, colourability and wear resistance, UV- blocking textiles, Controlled release of active agents.

PART II: PLASMA TECHNOLOGY FOR TEXTILES

1. The Physics and Chemistry of Plasmas for Processing of Textiles

Introduction, gases used, plasmas generated, plasma chemistry, plasma surface collisions.

2. Low Pressure Cold Plasma Processing Technology

Low pressure vacuum plasma technology, plasma activation in the technical textiles and nonwoven industries, plasma deposition on nonwoven materials, the economics of vacuum plasma treatment for fabrics and nonwovens.

3. Atmospheric Pressure Cold Plasma Processing Technology

Basic manufacturing needs from plasma technology, Atmospheric pressure plasma types for textile processing, Atmosphere pressure plasma equipment for textile processing, Atmospheric pressure plasma surface properties for textile products.

4. Corona and Dielectric Barrier Discharge Plasma Treatment for Technical Applications

Special adoption of DBD technology for textiles, plasma induced surface activation of fibres, Deposition of nano layers by gas polymerization combination of DBD treatment and liquor deposition.

5. Textile Application of Plasma Technology

Plasma treatment of Textiles for water and soil repellency, Interfacial engineering of functional textiles for biomedical applications, plasma modification of wool, plasma modification of natural cellulosic fibres, plasma treatments of fibres and textiles.

6. Characteristics of Plasma Treated Textiles

Surface reaction in plasma treatment, techniques for characteristics of plasma treated textiles.

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Principles of Nanotechnology by Phani Kumar
2. Nanofibres & Nanotechnology in Textiles by P.J. Brown & K. Stevens.
3. New Millennium Fibres by G.O. Phillips & M.Takigami.

4. Analytical Electrochemistry in Textiles by P. Westbroek, G. Priniotakis & P. Kiekens.
5. Smart Textiles for Medicine & Healthcare by L. Van Langenhove.
6. The Nanoscope, Encyclopedia of Nano Science & nanotechnology Vol.-I to VI, Dr. Parag Diwan & Ashish Bharadwaj.
7. Nanotechnology in Fibres matures: A New Perspective, Textile Progress, The Textile Institute by Rajesh D. Anandiwala.
8. Plasma Technology for Textiles by Roshan Shishoo, CRC Publication.
9. Plasma Surface Modification and Plasma Polymerization – Norihiro Inagaki: CRC Press.
10. Plasma Kinetic Theory –Donald Gary – CRC Publication.
11. Proceedings 2 : The 5th Asian Textile Conference Kyoto Research Park, Kyoto Japan by Federation of Asian Professional Textile Association

M. TEXT. (TECHNICAL TEXTILES) SEMESTER - II

4. DESIGN OF EXPERIMENTS & STATISTICAL APPLICATIONS IN TEXTILES

Lectures : 3 Hrs / Week

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

1. 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.

2. Design of Experiments:

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

3. 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)

4. Linear programming Problem:

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

5. Transportation Problem:

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

6. Assignment problem:

Introduction, method for solving assignment problem. Examples.

7. 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.(TECHNICAL TEXTILE) SEMESTER-II (ELECTIVE-II)

5. PROJECT PREPARATION, APPRAISAL & IMPLEMENTATION

Lectures	:	3 Hrs / Week
Assignment	:	1 Hrs / 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, Payback 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 & Cybranl 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.(TECHNICAL TEXTILE) SEMESTER-II (ELECTIVE-II)

5. PRODUCT DESIGN AND DEVELOPMENT IN TECHNICAL TEXTILES

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

1. General overview of innovation and textile product development

Innovation and new product development in textiles, Introduction: incremental change versus disruptive innovation, Forces for innovation, organizing for disruptive innovation, the textile industry and innovation, Trends in textile innovation: wearable electronics, biomedical, biomimetic and nano-textiles, Case studies in innovation in textile manufacture

2. Practical aspects of innovation in the textile industry

Introduction and practical aspects of innovation, Meeting the needs of customers better than the competition, Innovation as a driver of new strategic issues in the apparel industry, Future trends in innovation

3. Textile product development and definition

Introduction, Nylon to Tactel, Sustainability, Future trends

4 New product developments in knitted textiles

Introduction, Seamless knitwear, Printing on knitwear, Computer aided knitwear design (CAD) and virtual knitwear

5. Fabrics and new product development

Introduction, Market demand, Functionality responses, Environmental sustainability responses, sensing textiles responses,

6. New product development in automotive upholstery

Introduction, The automotive textile market, key drivers and supply chain, New product development process for automotive upholstery, Novel materials and processes in automotive upholstery, Future developments in automotive upholstery

7. Nanotechnology innovation for future development in the textile industry

Introduction, Nanotechnology in the textile industry, Adoption of nanotechnology for textile applications

8. New product development in interior textiles

Introduction, New product development of interior textiles – basics and general procedures, Case studies, Learning experiences for successful new product developments of interior textiles, Future trends in interior textiles

9. New product development for e-textiles

Introduction, Integration of electronics and fabrics, E-textiles product development challenges

10. Customer co-creation: moving beyond market research to reduce the risk in new product development

Introduction, Challenges of identifying customer needs in the product development process

11. Product Engineering: Objectives and Scope of product development in textiles and clothing. performance and serviceability concepts in textiles. Effect of changes in fibre, yarn type and fabric construction and finishing on performance and serviceability of textile products.

12. Consideration of a good product design. Product development procedure -Selection of product, Product analysis, Product design procedure- Preliminary design, Maintainability, Reliability and Redundancy, Final design.

13. Product life cycle.

14. Market Research, Material Research, Equipment and process research,

15. Simulation of specified properties or structures leading to design – Special yarns, Woven fabrics, Non – woven fabrics, Simulation of material, Texture by using computer graphics, Concept of overall designing procedure.

16. Case studies related to product development of technical textiles.

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS:

1. New product development in textiles: Innovation and production, Edited by L. Horne, Published by Woodhead Publishing Limited in association with The Textile Institute, 2012

2. Hand book of Textile Design Principles, Process and Practice by Jacquie Wilson, Textile Institute Publication.

3. The Design Logic of Textile Products, Textile progress vol. 27, No. 3, T Matuo and M. N. Suresh. The Textile Institute Publication.

4. Engineering Design by George Dieter.

5. Proceedings of the Seminar – Non woven Technology, Market and Product Potential, IIT, New Delhi, December 2006

M.TEXT.(TECHNICAL TEXTILE) SEMESTER-II (ELECTIVE-II)

5. NON WOVEN TECHNOLOGY

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

1. Historical background of nonwovens, non woven definition, stages in Non woven manufacturing
2. Web Forming Techniques: carding, Garneting, air laid, wet process, polymer extrusion.
3. Classification of nonwoven – On the basis of use, on the basis of manufacturing process, on the basis of web formation, on the basis of bonding.
4. Dry laid webs – fibre selection, fibre preparation, web formation, layering, Wet laid nonwoven – Raw materials, production process, special features of the wet laid process and its product. Spun laced webs
5. Mechanically bonded webs – needle punched nonwovens, Application of needle punching, stitch bonded nonwovens, applications.
6. Hydro entangled nonwovens – Bonding process, water system, filtration system, web drying, properties of spun laced webs, applications.

7. Chemically bonded nonwoven – Latex binder, other types of nonwoven binders, formulation, order of formulation, bonding technology – saturation, foam bonding, spray bonding, print bonding, powder bonding, application of chemical bonded nonwovens.
8. Thermally bonded nonwovens – binder, binding fibres, binding powder, binding webs, methods of thermal bonding – Hot calendaring, belt calendaring, oven bonding, ultrasonic bonding, radiant heat bonding.
9. Melt blown nonwovens
10. Composite Nonwovens
11. Nonwoven fabric finishing: Introduction, Wet finishing, Application of chemical finishes, Lamination, Mechanical finishing, Surface finishing, Developing technologies, Fabric inspection
12. Process variables, advantages, disadvantages and techno economics study of all above non woven technologies.

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Nonwoven Process Performance & Testing – Turbak
2. Nonwoven Fabric Construction Synthetic Fibres – Jan-Mar 2007.
3. Proceedings of the Seminar - Nonwoven Technology Market & Product Potential, IIT, New Delhi December 2006.
4. Handbook of nonwovens, Edited by S. J. Russell, Wood head Publishing, CRC Press, Washington DC, 2007
5. W.Albrecht, H. Fuchs and W.Kettelmann, Nonwoven Fabrics: Raw Materials, Manufacture, Applications, Characteristics, Testing Process, Wiley-VCH,Verlag GmbH & Co.KGaA, Weinheim, 2003.
6. M.S. Casper, Nonwoven Textiles, Noyes Data Corp.(Park Ridge, N.J), 1975.
7. M. McDonald, Nonwoven Fabric Technology, Park Ridge, NJ: Noyes Data, 1971

M.TEXT.(TECHNICAL TEXTILE) SEMESTER-II (ELECTIVE-II)

5. RECYCLING OF TEXTILES

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

1. General textile recycling issues and technology

Textile recycling: a system perspective, Introduction, Systems theory, Understanding the textile and apparel recycling process, Textile recycling companies, The sorting process, The pyramid model, Textile recycling constituents

2. Designing textile products that are easy to recycle

History, Product responsibility, Current situation in Germany, Basic methods, Examples

3. Carpet stewardship in the United States - a commitment to sustainability

Introduction, Carpet industry environmental stewardship, Carpet recycling – early efforts, The Carpet America Recovery Effort, Creating a new industry – material flows, The role of non-carpet products in carpet recycling

4. Systems planning for carpet recycling

Introduction, The need for strategic systems planning, Previous system issues, The estimation of carpet recycling volumes, Initial collection schemes, The alternative structures for consolidating and sorting of carpets, Case studies

5. Carpet recycling technologies

Introduction, Fiber identification and sorting, Size reduction, Mechanical separation of carpet components, Solvent extraction of nylon from carpet, Depolymerization of nylon, Melt processing, Use of waste fibers as reinforcement in polymer composites, Waste to energy conversion

6. Recycling waste water from textile production

Introduction, System analysis, Optimization of processes for water recycling, direct re-use of waste water, Waste water treatments and water recycling with membrane technology, Re-use of reclaimed/recycled water, Future trends

7. Recycling and re-use of textile chemicals

Introduction, Fabric preparation processes, Dyeing and printing processes, recycling of finishing compounds, Waste minimization at source

8. Recycled textile products: Development of products made of reclaimed fibres

Reclaimed fibres as raw materials, Characteristics of reclaimed fibres, Products and markets

9. Manufacturing nonwovens and other products using recycled fibers containing spandex

Introduction, Spandex, Review of recycling, Evaluation and characterization of the remnant material, Fiber separation trial at recycling plant, Laboratory-scale processing of the recycled material, Chemical treatment of the raw material, Mechanical processing of the chemically treated samples, Types of nonwovens, Markets for needle-punched fabrics, Experiments in production of nonwoven samples, Oil absorption with fibrous waste

10. Applications of recycled textiles

Recycling of textiles used in the operating theatre, Standards, Products, Materials, Properties required, Market, Environmental aspects, Waste management

11. Composite products from post-consumer carpet

Introduction, Separating carpet, Composites from sorted carpet, Wood fiber reinforced composites, Products from reinforced post-consumer carpet

12. Utilization of recycled carpet waste fibers for reinforcement of concrete and soil

Introduction, Fiber reinforced concrete, Recycled fiber reinforced concrete, Fiber reinforced soil, Recycled fiber reinforced soil

Term Work

Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-

1. Recycling in textiles, Edited by Youjiang Wang, Published by Woodhead Publishing Limited in association with The Textile Institute, 2006
2. Nonwoven Textiles by L.C. Wadsworth.
3. Handbook of Industrial Textiles, Sabit Adanur
4. Nonwovens from Recycled fibres, Asian Textile Journal

M.TEXT.(TECHNICAL TEXTILES) 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 technical textiles. 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.(TECHNICAL TEXTILES) 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.(TECHNICAL TEXTILES) 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.(TECHNICAL TEXTILES) 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.(TECHNICAL TEXTILES) 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.- (TECHNICAL TEXTILES) SEMESTER-I**

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SU
1.	M.Text.(Tech. Textiles)	Manufacture of Fabrics for Technical Textiles	I	Advances In Fabric Str Engineering-I
2.	M.Text.(Tech. Textiles)	Industrial Application of Textiles	I	Industrial Applications C
3.	M.Text.(Tech. Textiles)	Advanced Computer Programming	I	Advanced Computer Pr Applications
4.	M.Text.(Tech. Textiles)	Nanotechnology in Textiles	I	Textiles for Protection
5.	M.Text.(Tech. Textiles)	ELECTIVE-I 1) Textiles for Protection 2) Textiles for Sports Application	I	ELECTIVE-I 1) Functional & High P 2) Textiles in Sports
6	M.Text.(Tech. Textiles)	SEMINAR-I	I	SEMINAR-I

D.K.T.E.SOCIETY'S TEXTILE & ENGINEERING INSTITUTE, ICHALKARANJI.

Equivalence of subject at M.Text. to Revised M.Text. Course.

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-II

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS
1.	M.Text.(Tech. Textiles)	Plasma Technology for Textiles	II	Surface Treatments for Textiles
2.	M.Text.(Tech. Textiles)	Medical Textiles	II	Industrial Applications of Textiles
3.	M.Text.(Tech. Textiles)	Statistics for Textile Mill Management	II	Design Of Experiments Applications In Textiles
4.	M.Text.(Tech. Textiles)	Fibre Reinforced Composites	II	Advances in Fabric Structure Engineering-II
5.	M.Text.(Tech. Textiles)	Elective-II	II	Elective-II

	Textiles)	1)Textiles In Automobile Engineering 2) Intelligent Textiles And Clothing		1) Nonwoven Technolo 2) Project Preparation, Implementation
6.	M.Text.(Tech. Textiles)	SEMINAR-II	II	SEMINAR-II

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-III

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

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-IV

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(Tech. Textiles)	Seminar-IV	IV	Seminar-IV	IV
2.	M.Text.(Tech. Textiles)	Dissertation	IV	Dissertation	IV

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Equivalence of subject at M.Text. to Revised M.Text. Course.

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-I

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEM-ESTER
1.	M.Text.(Tech. Textiles)	Manufacture of Fabrics for Technical Textiles	I	Advances In Fabric Structure And Engineering-I	I
2.	M.Text.(Tech. Textiles)	Industrial Application of Textiles	I	Industrial Applications Of Textiles-I	I
3.	M.Text.(Tech. Textiles)	Advanced Computer Programming	I	Advanced Computer Programming And Applications	I
4.	M.Text.(Tech. Textiles)	Nanotechnology in Textiles	I	Textiles for Protection	I
5.	M.Text.(Tech. Textiles)	ELECTIVE-I 1) Textiles for Protection 2) Textiles for Sports Application	I	ELECTIVE-I 1) Functional & High Performance Fibres 2) Textiles in Sports	I
6	M.Text.(Tech. Textiles)	SEMINAR-I	I	SEMINAR-I	I

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Equivalence of subject at M.Text. to Revised M.Text. Course.

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-II

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(Tech. Textiles)	Plasma Technology for Textiles	II	Surface Treatments for Technical Textiles	II
2.	M.Text.(Tech. Textiles)	Medical Textiles	II	Industrial Applications of Textiles-II	II
3.	M.Text.(Tech. Textiles)	Statistics for Textile Mill Management	II	Design Of Experiments & Statistical Applications In Textiles	II
4.	M.Text.(Tech. Textiles)	Fibre Reinforced Composites	II	Advances in Fabric Structure & Engineering-II	II
5.	M.Text.(Tech. Textiles)	Elective-II 1)Textiles In Automobile Engineering 2) Intelligent Textiles And Clothing	II	Elective-II 1) Nonwoven Technology 2) Project Preparation, Appraisal & Implementation	II
6.	M.Text.(Tech. Textiles)	SEMINAR-II	II	SEMINAR-II	II

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-III

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

M.TEXT.- (TECHNICAL TEXTILES) SEMESTER-IV

SR. NO.	COURSE	PRE-REVISED SUBJECTS	SEM-ESTER	REVISED SUBJECTS	SEMESTER
1.	M.Text.(Tech. Textiles)	Seminar-IV	IV	Seminar-IV	IV
2.	M.Text.(Tech. Textiles)	Dissertation	IV	Dissertation	IV