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**ELECTIVE-I**

1. TEXTILE REINFORCED COMPOSITE MATERIALS
2. ENGINEERING OF APPAREL FABRICS AND GARMENTS
3. NANO FIBRE TECHNOLOGY
4. FUNCTIONAL & HIGH PERFORMANCE FIBRES
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**Elective-II**

1. Geo-Textiles & Geo-Synthetics
2. Textile Product Engineering
3. Clothing Science
4. Project Preparation, Appraisal & Implementation
### Semester III

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**Teaching---**
- L: Lectures
- PR: Practicals
- A: Assignments

**Examination**
- TH: Theory Paper Marks
- TW: Term Work Marks
- OE: Oral Exam. Marks
### M.TEXT.(TEXTILE TECHNOLOGY) SEMESTER-I

#### 1. ADVANCES IN YARN MANUFACTURING TECHNOLOGY – I

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4) **Theories of drafting.** Causes for irregularity in drafted strand. Role of fibre friction in drafting – Drafting force – Definition, Measurement and study of factors affecting

5) Auto levelling: - Concept and necessity. Types of auto levellers, their applications and evaluation.


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

REFERENCE BOOKS:-

   Vol.VI - Man-made fibre spinning – W.Klein

2) Series publications of NCUTE Training Programs

3) ‘Fundamentals of Spun Yarn Technology’ by Carl A. Lawrence.

4) ‘Spun Yarn Technology’ by Eric Oxtoby.

5) Yarn Production-Theoretical Aspects by P.Grosberg & C.lype.

6) Textile Progress Series by Textile Institute,Manchester.
M.TEXT.(TEXTILE TECHNOLOGY) SEMESTER-I

2. ADVANCES IN FABRIC MANUFACTURING TECHNOLOGY-I

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

1) Technological significance in the design development of automatic winding machine with respect to unwinding accelerator, auto speed, yarn tensioners, various splicers, clearers & fault removal, contamination clearers, yarn guide drum & winding unit, length & diameter measurement etc.

2) Influence of winding process on yarn quality, package build. Various package quality for different application such as weaving, knitting, dyeing etc. Research articles based on unwinding yarn tension, yarn clearers, package build, speed & its variation, changes in yarn quality during winding.

3) Modern electronic control system & their role in optimizing quality & productivity. Techno-economical aspects of winding.

4) Technological significance in the design developments of beam and sectional warping machine with respect to creels, design, tensioners, drum design, Drive, geometrical aspects of machines. Modern Electronic control systems.

5) Influence of warping process on yarn quality, beam build. Research articles based on yarn tension, speed, beam build etc.

6) Technological significance in the design development of sizing machine with respect to creel saw box, pre-drying, drying, and headstock. Modern quality control systems
such as temperature, size pick up, stretch control, moisture control, PLC Drive etc. Synthetic ingredients & their suitability.

7) Influence of process parameters on yarn quality and processing behaviour

8) Automation in sizing process, size recipe formulation & re-circulation. Modern electronic control systems. Research articles based on tension, stretch, size recipe & machine design etc.

9) Knitting: Study of design, functional and constructional aspects of different zones of circular knitting machines, such as yarn feeding zone, loop forming zone and fabric takedown zone. Effect of machine and material parameters on fabric quality. Geometrical aspects of knitting fabrics. Such as wale and coarse density, stitch length, Run in ratio, Tightness factor. Study of research articles on robbing back, yarn tension, Spiriality, dimensional stability, fibre fly generation, barriness, shrinkage, effect of yarn quality parameters, yarn lubrication, Prediction of fabric dimensional properties, effect of processing on fabric dimensional characteristics.

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

REFERENCE BOOKS:-

1. Modern Preparation & Weaving Machinery by A. Ormerod.
4. Warp Sizing by J.B. Smith.
7. Circular Knitting Technology – IIT, Delhi, Publication.
3. THEORY OF TEXTILE STRUCTURES – I

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

1. A brief review of fibre structure and morphology, Structures of different fibres and their effect on fibre properties.


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

**REFERENCE BOOKS:-**

1. Fibre Science – Edited by J.M. Preston, Published by The Textile Institute, Manchester.
2. Cotton Testing by Steadman,
3. Physical Testing of Textiles by B.P. Saville
10. Textile Yarn by Martindale and Goswami.
M. TEXT. (TEXTILE TECHNOLOGY) SEMESTER - I

4. ADVANCED COMPUTER PROGRAMMING AND APPLICATIONS

Lectures : 3 hrs/week
Assignment : 1 hr/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 [8]

Unit-II

Relational Databases
Relational Model, Database Users, Roles of Database Administrator, keys, Domain Constraints, Referential Integrity, Structured Query Language (SQL), Database recovery methods [8]

Unit-III

E-Commerce
Unit-IV
**ERP and Its Related Technologies**

Unit-V
**SAP**

Unit-VI
**Business Intelligence System**

**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.(TEXTILE TECHNOLOGY) SEMESTER-I

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

- Lectures : 3 hrs/week
- Assignment : 1 hr/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

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
5. Kevlar Aramid Fibres by yang.
### M. TEXT. (TEXTILE TECHNOLOGY) SEMESTER - I (ELECTIVE-I) 
#### 5. TEXTILE REINFORCED COMPOSITE MATERIALS

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<td>Subject Total</td>
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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, A statistical treatment of fiber strength.
   Matrices: polymer matrices, metal matrices, ceramic matrices.

3. **Fiber architecture:**
   Volume fraction and weight fraction, fiber packing arrangements, clustering of fibers and particles.
   Long fibers: laminates, woven, braided and knitted fabric arrays, characterisation of fiber orientations in a plane.
   Short fibers: fiber orientation distributions in three dimensions, fiber length distributions.

4. **Fabrication:**
   Liquid resin impregnation routes, pressurized consolidation of resin prepregs, injection mouldings of thermoplastics, hot press mouldings of thermoplastics, powder blending and consolidation, physical vapour deposition diffusion bonding of foils, Layered ceramic composites, reactive processing, carbon/carbon composites, powder based routes.

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

7. Strength of composites:
Failure mode of long fibers like axial tensile failure, transverse tensile failure, shear failure, failure in compression.
Failure of laminae under off-axis loads. Strength of laminates like tensile cracking, interlaminar stresses and edge effects.
Basic concepts of fracture mechanics, interfacial fracture and crack deflection.
Contributions to work of fracture like Matrix deformation, fiber fracture, interfacial debonding and frictional sliding.
Subcritical crack growth like fatigue and stress corrosion cracking.

8. Thermal behavior of composites: Thermal stresses and strains, thermal expansivities, thermal cycling of unidirectional composites, thermal cycling of laminates, basics of matrix and fiber in relation to creep, axial creep of long fiber composites, transverse creep and discontinuously reinforced composites.
Thermal conduction mechanism like heat transfer, conductivity of composites and interfacial thermal resistance.

9. 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.

Term Work
Assignments / Seminars / Mini Projects based on above topics.
REFERENCE BOOKS :-

1. Introduction to Composite Materials, Clyne and Hull
2. Fabre reinforced composites by P. K. Mallick
7. 3-D Textile reinforcements in composite materials by Prof. A. Miravete
M. TEXT. (TEXTILE TECHNOLOGY) SEMESTER - I ELECTIVE-I

5. ENGINEERING OF APPAREL FABRICS AND GARMENTS

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

1. Handle and making-up performance of fabrics and garments
Fabric Objective Measurement (FOM) of fabric handle and making-up performance, other methods, Effects of fibre properties, Effects of yarn properties, Effects of fabric properties, Effects of dyeing and finishing (chemical and mechanical) treatments

2. Wrinkling of fabrics and garments
The measurement of wrinkle and crease recovery, Surface smoothness after repeated laundering, Factors affecting fabric wrinkling and recovery, Factors affecting wrinkling during wear, Effects of fibre properties, Effects of yarn and fabric parameters, Effects of fibre, yarn and fabric processing parameters

3. Pilling of fabrics and garments
Effects of fibre composition and properties, Effects of yarn structure and properties, Effects of fabric structure and properties, Effects of fibre, yarn and fabric processing parameters

4. Bagging of fabrics and garments
The measurement of bagging, Effects of fibre properties, Effects of yarn properties, Effects of fabric properties, Effects of garment construction, Effect of finishing, Fabric bagging prediction and modelling

5. Fabric and garment drape
Drape measurement, Engineering fabric drape, Empirical prediction of drape, Modelling fabric and garment drape, Drape models in CAD and Internet systems
6. Appearance issues in garment processing
Seam appearance, Appearance issues in fusing, Appearance issues in garment dyeing, Appearance issues in pressing, Storage and packaging
Durability of fabrics and garments
Abrasion resistance, Fabric and garment strength, Effects of dyeing and finishing on fabric strength, Modelling and predicting fabric strength

7. Physiological comfort of fabrics and garments
Different aspects of clothing physiological comfort, Tactile comfort, Assessment of tactile comfort, Thermophysiological comfort, Liquid water transport properties of fabrics and clothing, Garment fit and ease of body movement, Pressure comfort, Effects of colour and surface texture, Effect of garment design, Effects of garment sizing and fit, Fashion and prejudice

8. Flammability of fabrics and garments
Burning mechanisms, Index for burning behaviour of textiles, Effects of fibre composition, structure and properties, Effects of yarn structure and properties, Effects of fabric structure and properties, Effects of fibre, yarn and fabric processing parameters, Effect of garment design, Test methods and standards for textiles and apparel

9. Waterproofing and breathability of fabrics and garments

10. Ultraviolet protection of fabrics and garments
Measurement of UV protection, Effects of fibre properties, Effects of yarn properties, Effects of fabric structure and properties, Effects of dyeing, finishing and other chemical treatments

11. Laundry performance of fabrics and garments
Laundering, Care labels, Effects of fibre composition, structure and properties, Effects of sewing thread linear density, Effects of fabric structure and properties, Effects of colouration and finishing, Effect of garment design, Test methods and standards related to laundering and care labeling.
12. Applications of artificial intelligence in fabric and garment engineering
Expert systems, artificial neural networks (ANNs)

Term Work
Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-
3. The Apparel Industry, Richard M Jones
4. Ergonomics in the garment industry, Dr Gordana Colovic, Woodhead Publishing India Pvt. Ltd., 2014
M. TEXT. (TEXTILE TECHNOLOGY) SEMESTER - I (ELECTIVE-I)

5. NANO FIBRE TECHNOLOGY

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1. Nano fiber production
Introduction, principles of electrostatic atomization, Electrospraying and electrospinning by the capillary method, Electrospraying and electrospinning by the charge injection method, Solution electrospinning, Melt electrospinning.

2. Types and processing of structured functional nanofibers:
Core-shell, aligned, porous and gradient nanofibers, Core-shell nanofibers, Aligned nanofibers, Porous nanofibers Gradient nanofibers, Applications of structured functional nanofibers.

3. Continuous yarns from electrospun nano fibers:
Using electrospun nanofibers: background and terminology, controlling fiber orientation, producing noncontiguous or short yarns, producing continuous yarns

4. Producing polyamide nanofibers by electrospinning:
Introduction, The electrospinning process, 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

5. Controlling the morphologies of electrospun nanofibres:
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.

6. **Processing of composite functional nanofibres:**
Formation of polymer and polymer composite nanofibers, Formation of polymer and nano particle composite nanofibers, Formation of polymer and inorganic salt composite nanofibers, Examples and applications of composite functional nanofibers

7. **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, Future trends

8. **Nanofilled polypropylene fibres:**
Introduction, Polymer layered silicate nanocomposites, the structure and properties of layered silicate, polypropylene nanocomposites, Nanosilica filled polypropylene nanocomposites, Calcium carbonate and other additives

9. **Applications:**
Filtration applications, drug delivery applications, tissue engineering, in lithium-ion batteries, sensor applications, clothing for protection against chemical and biological hazards, food processing, sound absorption, electromagnetic wave attenuation and bioreactor, water purification, microelectronics

10. **Developments in nanofibers:** Background, Nanotechnology, materials and nanofiber, Creation of new industries, Researches and global developments of nanofiber

**Term Work**

Assignments / Seminars / Mini Projects based on above topics.
REFERENCE BOOKS :-


2. Functional nanofibers and their applications, Edited by Qufu Wei, Wood head Publishing Limited, 2012

M.TEXT.(TEXTILE TECHNOLOGY) 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 technology (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 TECHNOLOGY) SEMESTER-II

**1. ADVANCES IN YARN MANUFACTURING TECHNOLOGY – II**

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2) Yarn Conditioning – Concepts and theory of yarn conditioning at lower temperatures. Study of effect of yarn conditioning on yarn properties and processing behaviour. Design principles of various yarn conditioning machines used in the industry.


6) Texturising – Critical evaluation of different texturising system – Significance of developments in false twist and air texturising technologies. Factors influencing the properties of false twist & air textured yarns.

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

REFERENCE BOOKS:-

   Vol.VI - Man-made fibre spinning – W.Klein
2. Series publications of NCUTE Training Programs.
3. Textile Progress Series by Textile Institute, Manchester
4. Fundamentals of Spun Yarn Technology by Carl A. Lawrence
5. Yarn Production-Theoretical Aspects by P.Grosberg & C.Iype.
6. Yarn Texturising Technology by Hearle.
M.TEXT.(TEXTILE TECHNOLOGY) SEMESTER-II

2. ADVANCES IN FABRIC MANUFACTURING TECHNOLOGY-II

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

1. Limitation of shuttle loom with respect to loom speed, picking, shuttle checking, sley motion, energy consumption.
3. Theory of weft insertion by rapiers, developments in rapier heads, positive, rapiers, developments in rapier drives, developments in rapier weaving.
4. Theory of weft insertion in air and water jet picking, developments in machine design, nozzles.
5. Design developments in high speed shedding devices, cam, dobbay and jacquard motions, developments in cam beat-up.
6. Developments in warp let off and take-up motions, motorized electronic take-up & let off.
requirements & design for pneumatic tyres, airbag & belts methods of productin & properties.


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

**REFERENCE BOOKS :-**
1) Weaving Technology & Operation by Allan Ormerod.
2) Shuttleless Weaving Machines by – Svaty.
3) Principles of Weaving by Robinson & Marks.
4) Weaving Handbook - Sulzer publication
5) Handbook of Technical Textiles
M.TEXT.(TEXTILE TECHNOLOGY) SEMESTER-II

3. THEORY OF TEXTILE STRUCTURE – II

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

   
   Rupture behaviour of continuous filament yarns – Rupture behaviour of low and high twist yarn, extension of continuous filament yarn. Effect of permanent extension, buckling and migration on tensile behavior of continuous filament yarn.
   
   Qualitative explanation of strength of staple yarns. Traditional and modified approach of rupture behavior of staple yarn.

2. **Yarn Engineering** – Translation of fibre properties in to yarn properties in case of single component spun yarn and blended yarns- Prediction of yarn strength from fibre properties using different techniques.

3. **Fabric geometry** – The geometrical properties of plain cloths – Pierce geometry of woven cloth – The geometry of jammed condition – geometry & non – plain fabrics, structure of non woven fabrics and it’s relation to end use behavior.

5. **The buckling of fabrics** – buckling of elastic materials, more complex forms of buckling. Compressional resilience – terms and definitions, significance, factors influencing compressional resilience, measurement of compressional resilience.


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

**REFERENCE BOOKS:**

1. Physical Testing of Textiles by B.P. Saville
5. Mario Bona – Textile Quality (Euratex Series).
6. Testing & Quality Management by Dr.V.K. Kothari (IIT-Delhi)
4. DESIGN OF EXPERIMENTS & STATISTICAL APPLICATIONS IN TEXTILES

Lectures : 3 hrs. / Week
Assignment : 1 hr. / 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:

7. Network Analysis:

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

REFERENCE BOOKS:-

1) Modern Elementary Statistics by J. Fruend.
2) Mathematical Statistics by J. Fruend.
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 TECHNOLOGY) SEMESTER-II (ELECTIVE-II)

5. PROJECT PREPARATION, APPRAISAL & IMPLEMENTATION

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.


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:-**

2) Goal Directed Project Management by E.S. Andersen, K.V. Grude & Tor Hang, Coopers & Cybranl Publication.
M. TEXT. (TEXTILE TECHNOLOGY) SEMESTER-II (ELECTIVE-II)

5. GEO-TEXTILES & GEO-SYNTHETICS

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

1. Overview of geo textiles, types of geo textile, development of Geo textiles, functions of Geo textiles.
2. Raw materials used fibre properties for geo textiles, production of Geo textiles. Such as wovens, non-wovens, knitted, grids, mats, ties, cellular Geo textiles, webs, stripes, bio degradable geo textiles, and their properties for different functions and test methods.
3. Types of soils, their characteristics, testing of soil.
4. Filtration and erosion control application. Principles, Erosion control for inland waterways, coastal erosion protection, scour protection, rain fall erosion control.
5. Drainage application: structural drainage, fin drains, land drainage etc.
6. Separation application: Unpaved Road, Paved road, Railways.
7. Soil Reinforcement application. Steep faced embankment, slope stabilization, retaining walls, Geo Textiles pile capping.
8. Growth of Geo textiles, potential of geo textiles in India.
10. The design principles of geosynthetics: Introduction, past practice in geosynthetic design, Present practice in geosynthetic design, possible future practice in geosynthetic design
11. The material properties of geosynthetics: Introduction, Physical properties, Mechanical properties, Hydraulic properties, Endurance properties, Degradation
12. The durability of geosynthetics: Introduction, Mechanisms of degradation, Synergistic effects, accelerated testing methods

14. Multifunctional uses of geosynthetics in civil engineering: Introduction, Composite geosynthetics, Smart geosynthetics, Active geosynthetics


**Term Work**

Assignments / Seminars / Mini Projects based on above topics.

**REFERENCE BOOKS :-**


2. Geo synthetics world by J. N. Mandal.

3. Designing with Geo synthetics by R. M. Koerner.

4. Periodicals on Non Woven & Geo Textiles.

5. Geotextiles by Dr P.K.Banerjee

6. Geotextiles by BTRA (Private circulation)

7. Geosynthetics in civil engineering, Edited by R. W. Sarsby, Published by Woodhead Publishing Limited in association with The Textile Institute, 2007
5. TEXTILE PRODUCT ENGINEERING

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


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

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.


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.


**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


4. Engineering Design by George Dieter.

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

5. CLOTHING SCIENCE

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

1. Clothing classification systems
General clothing classification, Harmonised clothing classification systems, Classification of functional clothing

2. Introduction to clothing biosensory engineering
Consumer trends, Definition of sensory comfort, Human–clothing–environment system, Clothing biosensory engineering

3. Psychology and sensory comfort
Perception of comfort, Psychological research techniques, Comfort sensory descriptors, Psychophysics, Scales of measurement, Scales to measure direct responses, Wear trial techniques

4. Clothing sizing systems
Clothing size and designation systems: a chronological review, European and international sizing systems, ISO clothing sizing systems, European designation of clothing sizes, The JUS clothing sizing system

5. Planning and organization of clothing production
Production planning and organization within a company, Clothing-design analysis and activity planning, Key documentation
6. Planning of clothing design, pattern making and cutting
Constructing garment patterns, Pattern-pieces and their preparation, Pattern cutting-markers, Designating cutting-markers, Defining fabric and other parameters, Technological requirements when arranging pattern-pieces within a cutting-marker, Cutting-marker efficiency, Fabric losses outside the cutting-marker, Determining fabric consumption

7. Planning clothing manufacturing
Analysis of clothing manufacture requirements and selection of appropriate equipment, Joining technologies, Work analysis, Identifying work methods, Selecting processing equipment, Types of sewing machine, Determining standard time, Planning manufacturing operations, Planning clothing assembly

8. Clothing production management
Determining production capacity needs, Production planning, Production scheduling, Production monitoring and control, Costs in production planning and management, controlling production planning and management

9. Quality requirements for clothing materials
Quality requirements for textile materials for clothing, Physical characteristics: types, methods of measurement and tolerances, Performance characteristics: types, methods of measurement and minimum quality standards, Visible faults, Care labelling of clothing and textile products, Ecological labelling of clothing and textile products

10. Product development in the apparel industry
11. Role of fabric properties in the clothing-manufacturing process
Fabric properties and performance, Garment make-up process and fabric properties, Low-stress mechanical properties and make-up process, Control system, Fabric tailorability, buckling and formability, Sewability

12. Fabric sourcing and selection
Fabric sourcing, Fabric inspection

13. Garment-finishing techniques
Garment finishing for functionality, Knitwear finishing, Denim garment finishing, Pressing (factors and equipment)

Term Work
Assignments / Seminars / Mini Projects based on above topics.

REFERENCE BOOKS :-
1. Design of clothing manufacturing: A systematic approach to planning, processes scheduling and control, Jelka Geršak, Published by Woodhead Publishing in association with The Textile Institute, 2013
2. Garment Manufacturing Technology Edited by Rajkishore Nayak and Rajiv Padhye, Published by Woodhead Publishing in association with The Textile Institute, 2015
4. Clothing biosensory engineering, Edited by Y. Li and A.S.W. Wong, Published by Woodhead Publishing Limited in association with The Textile Institute, 2016
M.TEXT. (TEXTILE TECHNOLOGY) 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 Technology. 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 TECHNOLOGY) 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.
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 TECHNOLOGY) 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 TECHNOLOGY) 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.


M.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-I

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| 5.      | M.Text.(TT) | Elective-I  
1) High Performance Fibres 
2) Technical Textiles | I | Elective-I  
1) Functional & High Performance Fibres 
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M.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-II

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| 5.      | M.Text.(TT) | Elective-II  
1) Project Preparation, Appraisal & Implementation 
2) Management of Textile Production | II | Elective-II  
1) Project Preparation, Appraisal & Implementation 
2) Textile Product Engineering |
| 6.      | M.Text.(TT) | Seminar-II | II | Seminar-II |

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

### M.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-IV

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

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

**M.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-I**

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**M.TEXT.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-II**

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## M.TEX.T.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-III

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## M.TEX.T.- T.T. (TEXTILE TECHNOLOGY) SEMESTER-IV

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