GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Textile Processing Technology

Subject Code : DI04028071

Subject Name : Processing of Technical Textiles

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	MOPEC

Prerequisite:	Basics of Textile Fibres & Yarns, Textile Fabric Structures and Fundamentals of Textile Wet Processing / Pretreatment & Dyeing.
Rationale:	Technical textiles are high-performance textile materials engineered for specific functional and industrial applications such as Agro-Tech, Geo-Tech, Med-Tech, Build-Tech, Mobil-Tech, Pro-Tech, Sport-Tech and Home-Tech. Unlike conventional apparel textiles, they must meet stringent performance standards related to strength, durability, protection, comfort, filtration, reinforcement and safety. This course focuses on the processing aspects—pretreatment, coloration, coating, lamination, functional finishing and quality control—required to convert suitable textile substrates into technical textile products. Understanding the relationship between fibre/fabric selection, process parameters and end-use performance will enable diploma students to support production, quality and R&D activities in the technical textile industry and promote eco-friendly, sustainable processing routes.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	**Explain** the concept, scope and classification of technical textiles and **identify** suitable fibre and fabric substrates for different technical textile end-uses.	R,U
02	**Describe** the general properties, importance and applications of major technical textile segments such as Hometech, Agrotech, Meditech, Geotextiles, Clothtech, Mobiltech, Sporttech, Indutech, Buildtech, Packtech, Protech and Oekotech.	U
03	**Apply** knowledge of functional finishes and polymer processing techniques (calendaring, casting, thermoforming, foaming, lamination, moulding) to **meet specific performance requirements** of technical textile products.	U,A
04	**Analyze** the structure–property–application relationships of key polymers (PE, PS, PVA, PVC, PTFE, PU, silicone, rubbers) and high-performance fibres (carbon, polypropylene, aramid, ceramic, silicon carbide, glass) used in technical textiles.	R,U

05	**Evaluate** the quality, performance and sustainability of technical textiles using appropriate testing methods, standards and eco-friendly processing considerations.	U,A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	0	3	70	30	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Unit I – Introduction to Technical Textiles and Substrates** 1.1 Definition, scope and growth of technical textiles – global and Indian scenario. 1.2 Distinction between conventional textiles and technical textiles. 1.3 Fibres and polymers used: high-tenacity polyester, polyamide, polypropylene, glass fibres, aramids, carbon fibres, high-performance cotton, viscose, speciality fibres (FR fibres, high-modulus fibres, bicomponent fibres). 1.4 Fabric structures and substrates: woven, knitted, nonwoven, braided, multiaxial, composite preforms; their relevance to processing and finishing.	8	20
2.	**Unit II- Technical Textiles** General properties, Importance and application of various Technical Textiles 2.1 Hometech 2.2 Agrotech 2.3 Meditech. 2.4 Geotextiles. 2.5 Clothtech. 2.6 Mobitech 2.7 Sporttech 2.8 Induteh 2.9 Buildtech	09	20

	2.10 Pachtech 2.11 Protech 2.12 Oekotech		
3.	**Unit III – Functional Finishes and Coating Technologies** 3.1 Concept of functionality and durability in technical textiles. 3.2 Application methods for finishes: padding, exhaustion, spray, foam finishing, kiss-roll, knife-over-roll, screen coating (overview). 3.3 Important functional finishes for technical textiles: • Flame retardant finishes • Water, oil and soil repellent finishes • Antimicrobial and antifungal finishes • Antistatic finishes • UV-protective finishes 3.4 Different processing techniques for Technical polymer • Calendaring • Casting • Thermoforming • Foaming • Lamination • Moulding	09	20
4.	**Unit IV - Various Individual polymers and high-performance fibres** 4.1 Various individual polymers • Polyethylene, Polystyrene, Polyvinyl • alcohol & Polyvinyl chloride • Polytetrafluoroethylene (PTFE) • Polyurethane • Silicone polymers • Rubbers (Elastomers) ➢ Natural Rubber (Poly isoprene) ➢ Synthetic Rubber (vulcanized Rubber) 4.2 General Properties, Importance and application of various High performance textiles • Carbon fibres • Poly-Propylene • Aramide fibres • Ceramic fibres	09	20

	• Silicon carbide fibres • Glass Fibre		
5.	**Unit V – Quality Control, Testing and Standards** 5.1 Testing of technical textiles – principle, significance and typical method for: • Tensile, tear, bursting strength. • Air permeability • water repellency • Flame retardancy • Antimicrobial activity • UV protection factor (UPF) • Evaluation of coating and lamination quality: adhesion, peel strength, flexibility, cracking resistance. 5.2 Eco-friendly and sustainable processing: low-liquor-ratio processes, low-add-on application, solvent-free systems, bio-based finishes(concept).	10	20
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	10	10	10	10	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:
(a) Books:

1. R. Horrocks & S. C. Anand (Eds.), *Handbook of Technical Textiles*, Woodhead Publishing.
2. S. C. Anand, J. F. Kennedy, M. Miraftab, S. Rajendran, *Medical and Healthcare Textiles*, Woodhead Publishing.
3. P. K. Hari, *Technical Textiles*, Woodhead / Woodhead India.
4. K. L. Deopura et al., *Polyester and Polyamides* (selected chapters on high-performance fibres).
5. M. Chandra & P. B. S. Kumar, *Textile Finishing: Recent Developments*, NCUTE / IIT Delhi

(b) Open source software and website:

1. Ministry of Textiles – Government of India, and Indian Technical Textile Association (ITTA) websites.
2. NPTEL / SWAYAM video lectures on Technical Textiles and Textile Finishing.

Suggested Project List:

Sr. No.	Title of Project	Brief Description / Expected Outcome
1	Processing Route for a Meditech Product (Hospital Linen / Patient Gown)	Prepare a flow-chart and short report on fibre/fabric selection, pretreatment, dyeing/printing and functional finishes (e.g. antimicrobial, easy-care) used for Meditech fabrics.
4	Mini Case Study on Geotextiles or Filtration Fabrics	Prepare a case study on any one product (road/river geotextile, dust filter bag, RO/UF cartridge covering, etc.) including substrate, processing sequence and key performance parameters required in service.
6	Eco-friendly / Sustainable Processing Route for a Selected Technical Textile	Design a proposed process sequence for any one technical textile product (e.g. workwear, medical gown, agro-shade net) using low-L:R processes, low-add-on finishes and eco-friendly chemicals, with justification for each step.
8	Sample File / Display Board of Technical Textile Products	Create a labelled sample file or display board with different technical textiles (Agrotech, Geotech, Meditech, Hometech, Sporttech, etc.) with brief notes on end-use, fibre/fabric type and required processing/finishes.

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