GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Textile Manufacturing Technology

Subject Code : DI04029031

Subject Name : Technical Textiles

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

Prerequisite:	Basic knowledge of various textile fibers and their properties, with particular emphasis on high-performance fibers and different fabric types such as woven, knitted, and nonwoven.
Rationale:	The course Technical Textiles is designed to equip Diploma students in Textile Manufacturing with the knowledge and skills required to work in one of the most dynamic and fast-growing segments of the textile industry. Technical textiles extend far beyond apparel and home furnishings, serving specialized functions across twelve key application areas: Agrotech, Buildtech, Clothtech, Geotech, Hometech, Indutech, Meditech, Mobiltech, Packtech, Protech, Sportech, and Oekotech. These sectors require materials with specific performance characteristics, including strength, durability, filtration efficiency, biocompatibility, protection, and environmental resistance. The course introduces the fibres, yarns, fabrics, and manufacturing technologies used to meet these functional requirements. Students learn how textile structures are engineered for end-use performance in diverse fields, including agriculture, construction, healthcare, transport, and environmental protection. With increasing industrial adoption of advanced textile solutions, this course provides a strong rationale for preparing students to understand specialized applications, follow standards, and contribute to innovation in high-value technical products.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain the fundamental concepts, classification, scope, and future prospects of technical textiles, including their distinction from traditional textiles and the basics of textile composites.	R, U, A
02	Describe the functional requirements and applications of technical textiles in transportation, industrial operations, and medical/hygiene sectors, and identify suitable fibres and materials for these uses.	R, U, A
03	Identify and evaluate the materials and structures used in Hometech, Clothtech, and Agrotech applications, and relate textile properties to specific end-use requirements in these sectors.	R, U, A, N

04	Explain the roles of technical textiles in construction and geotechnical applications, interpret functional properties of geotextiles, and compare woven, nonwoven, and composite geotextile structures.	R, U, A, N
05	Analyze the performance characteristics of textiles used in sports, protection, packaging, and environmental applications, and select appropriate materials based on functional demands.	R, U, A, N, E, C

**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	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1. Introduction to Technical Textiles	• Overview of the technical textile industry and market demand • Definition and scope of technical textiles • Comparison between Traditional and Technical Textiles • Classification of Technical Textiles based on Applications – Agrotech, Buildtech, Clothtech, Geotech, Hometech, Indutech, Medtech, Mobiltech, Oekotech, Packtech, Protech, and Sporttech. • Growth areas and industry opportunities in technical textiles • Textile Composites – Definition, Components (Reinforcement and Matrix) • Applications of Composites (helmets, windmill blades, automotive parts, etc) • Types of Composites – Thermoplastic and Thermoset Composites	7	15%
2. Transport, Industrial and	**2.1 Textiles in Transportation (Mobiltech)** • Applications in road vehicles, rail, aircraft and marine	10	25%

Medical Textiles	• Materials used in: seat belt webbing, airbags, tyre cords, interior fabrics (upholstery, headliners) **2.2 Textiles in Industries (Indutech)** • Filtration textiles (dry and wet), filter bags, dust collectors • Conveyor belts, tarpaulins and tents • Reinforcements for industrial equipment – printed circuit boards (PCB), seals and gaskets **2.3 Textiles in Medical and Hygiene (Medtech)** • Different fibres used in medical textiles • Essential fibre characteristics required for medical textile applications • Applications: wipes, diapers, sanitary napkins, gowns, drapes, sterilisation packs, dressings, bandages • Introduction to mask materials, isolation gowns • Biomedical implants – Artificial ligaments, veins and arteries, skin replacement		
3. Home, Clothing and Agriculture Textiles	**3.1 Textiles used in Home Application (Hometech)** • Furnishings: curtains, mattress ticking, upholstery support • Carpet backing structure • Cleaning textiles: wipes, mops, dusters **3.2 Textiles used in Clothing Sector (Clothtech)** • Sewing threads (properties and uses) • Interlinings for garments • Waddings and insulating materials for jackets, quilts **3.3 Textiles used in Agriculture and horticulture Sector (Agrotech)** • Crop covers, shade nets, anti-hail nets • Weed suppression fabrics • Capillary nonwoven matting • Essential fabric performance requirements (UV resistance, tensile strength, air permeability)	8	15%
4. Construction Textiles and Geotextiles	**4.1 Textiles in building and construction sector (Buildtech)** • Temporary and semipermanent structures • Textile-reinforced roofing materials • Coated fabrics in construction • Basic introduction to composite usage in construction **4.2 Geotextiles (Geotech)**	10	15%

	• Functional properties of Geo-textile: Separation, Drainage, Filtration, Reinforcement • Characteristics of Geotextile fabrics: woven and non-woven • Applications: Geogrids, Geonets, Geocomposite, Geomembranes • Application of geotextiles in road underlay, slope stabilisation, retaining walls		
5. Sport, Protective, Packaging, and Environmental Protection Textiles	**5.1 Textiles in Sports Applications (Sporttech)** • Materials for helmets, gloves, sports shoes and balls • Essential features of fabrics for parachutes, hot-air balloons, and sailcloth. **5.2 Textiles in Protection (Protech)** • Principles of protection: impact, heat, chemicals • Definition of Personal protective equipment (PPE) • Basic concept and material characteristics required for Bullet-resistant (bulletproof), fire-resistant (fireproof), and chemical-protection fabrics **5.3 Textiles in the Packaging sector (Packtech)** • Flexible packaging textiles • Food-industry packaging fabrics • FIBCs, sacks, wrapping materials **5.4 Textiles for environmental protection (Oekotech)** • Textiles for pollution control • Landfill liners, erosion control mats • Oil absorbent mats, eco-friendly filter media	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**
20	**30**	**30**	**10**	**5**	**5**

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. Handbook of Technical Textiles, Volume 1: Technical Textile Processes, Edited by: A. Richard Horrocks and Subhash C. Anand, 2nd Edition, Year: 2016, Publisher: Woodhead Publishing, ISBN: 978-1-78242-458-1, DOI: 10.1016/C2015-0-01011-5.
2. Handbook of Technical Textiles, Volume 2: Technical Textile Applications, Edited by: A. Richard Horrocks and Subhash C. Anand, 2nd Edition, Year: 2016, Publisher: Woodhead Publishing, ISBN: 978-1-78242-465-9.
3. Advances in Military Textiles and Personal Equipment, Edited by: E. Sparks, Year: 2012, Publisher: Woodhead Publishing Series in Textiles, ISBN: 978-1-84569-699-3.
4. Lightweight Ballistic Composites – Military and Law-Enforcement Applications, Edited by: Ashok Bhatnagar, 2nd Edition, Year: 2016, Publisher: Woodhead Publishing, ISBN: 978-0-08-100406-7, DOI: 10.1016/C2014-0-03657-X.
5. Lightweight Composite Structures in Transport – Design, Manufacturing, Analysis and Performance, Edited by: J. Njuguna, Year: 2016, Publisher: Woodhead Publishing, ISBN: 978-1-78242-325-6, DOI: 10.1016/C2014-0-02646-9.
6. Geotextiles From Design to Applications, Author: Robert Koerner, 1st Edition, Year: 2016, Publisher: Woodhead Publishing, ISBN: 9780081002346.
7. Matsuo, T. (2008). Advanced technical textile products. *Textile Progress*, *40*(3), 123–181. https://doi.org/10.1080/00405160802386063
8. Matsuo, T. (2008). Fibre materials for advanced technical textiles. *Textile Progress*, *40*(2), 87–121. https://doi.org/10.1080/00405160802133028
9. Barman, N. K., Bhattacharya, S. S., & Alagirusamy, R. (2024). Textile structures in concrete reinforcement. *Textile Progress*, *56*(1), 1–229. https://doi.org/10.1080/00405167.2023.2266930
10. Mukhopadhyay, S. K., & Partridge, J. F. (1999). Automotive textiles. *Textile Progress*, *29*(1–2), 1–125. doi:10.1080/00405169908688876

(b) Open source software and website:

1. https://nptel.ac.in/courses/116102050
2. https://nptel.ac.in/courses/116102047
3. https://nptel.ac.in/courses/116102049
4. https://www.mdpi.com/journal/textiles
5. https://or.niscpr.res.in/
6. http://www.textileassociationindia.org/

Suggested Course Practical List:

1. Demonstrate the chart of classification of technical textiles and their applications.
2. Identify the differences between traditional and technical textiles.
3. Demonstrate different transportation textile products and their applications.
4. Demonstrate different industrial textile products and their applications.

5. Demonstrate different medical textile products and their applications.
6. Demonstrate different home textile products and their applications.
7. Demonstrate different clothing textile products and their applications.
8. Demonstrate different agricultural textile products and their applications.
9. Demonstrate different building construction textile products and their applications.
10. Demonstrate different geotextile products and their applications.
11. Demonstrate different sports textile products and their applications.
12. Demonstrate different protective textile products and their applications.
13. Demonstrate different packaging textile products and their applications.
14. Demonstrate different environmental protection textile products and their applications.

List of Laboratory/Learning Resources Required:

1. Fabric Samples used in various sectors – Consumables
2. Padding mangle
3. Coating machine
4. Compression moulding machine
5. Tensile Strength Tester – yarn and fabric
6. Bursting Strength Tester
7. Air Permeability Tester
8. Water Permeability / Drainage Tester (Geotextile Tester)
9. GSM Cutter
10. Electronic Weighing Balance
11. Thickness Gauge
12. Microscope
13. Oven/Conditioning Chamber

Suggested Project List

1. Prepare a report on the various types of nonwoven materials used in technical textiles.
2. Prepare a report on medical textile products used in technical textiles.
3. Prepare a report on sports textile products used in technical textiles.
4. Prepare a report on automotive textile products used in technical textiles.
5. Prepare a report on industrial textile products used in technical textiles.
6. Prepare a report on packaging textile products used in technical textiles.
7. Prepare a report on composite materials used in technical textiles.
8. Prepare a report on high-performance fibre properties and their applications in technical textiles.

Suggested Activities for Students

1. Collect samples of nonwoven materials used in technical textiles and prepare a chart of their product specifications.
2. Collect samples of composite materials used in technical textiles and prepare a chart of their product specifications.
3. Collect samples of fibres, yarns, and fabrics used in technical textiles and prepare a chart of their product specifications.

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