GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Textile Manufacturing Technology

Subject Code : DI04029061

Subject Name : Textile Product Design and Development

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

Prerequisite:	Basic prior knowledge of textile materials, manufacturing processes, simple textile testing techniques, and fundamental fabric design skills.
Rationale:	The course Textile Product Design and Development is included in the Diploma in Textile Manufacturing to help students understand how textile products are conceived, designed, and transformed into commercially viable items. As the textile industry moves toward value-added products and rapid innovation, technicians must be able to link material properties with product performance while responding to market needs. The syllabus introduces students to the fundamentals of product design, material selection, and the structured workflow of developing apparel, home textiles, and technical textile products. Through design tools, prototyping, specification preparation, and evaluation methods, students learn how ideas progress from concept to final product. The course also highlights sustainability and emerging technologies, preparing learners to meet industry expectations for responsible and innovative design. By integrating creativity with technical knowledge, the course strengthens the ability of diploma graduates to contribute effectively to product development teams in modern textile manufacturing environments.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain the fundamentals of textile product design and the role of innovation, market needs, and product categories in the development process.	R,U,A
02	Select suitable fibres, yarns, and fabrics based on their structural and performance characteristics for specific textile products.	R,U,A
03	Apply basic design tools and methodologies to develop concepts, prepare design boards, and create preliminary prototypes using appropriate techniques.	R,U,A
04	Describe the complete product development workflow, prepare technical specifications, and assess the feasibility of manufacturing textile products.	R,U,A
05	Evaluate sustainable practices, advanced materials, and emerging technologies relevant to modern textile product development.	R,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	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1. **Fundamentals of Textile Product Design and Innovation**	1.1 Introduction of Textile Product Design 1.2 Role of innovation in modern textile industries 1.3 Market drivers, consumer needs, and competitive trends 1.4 Overview of new product development (NPD) models used in textiles 1.5 Classification of textile products: apparel, home textiles, technical textiles	6	13
2. **Materials for Product Development**	2.1 Fibre selection based on functional and aesthetic requirements 2.2 Yarn properties for specific end uses 2.3 Fabric structures (woven, knitted, nonwoven) and their suitability 2.4 Functional finishes and advanced materials (smart, sustainable, nanomaterials) 2.5 Material performance testing and standards used in NPD	9	20
3. **Design Process and Development Methodologies**	3.1 Idea generation and concept development approaches 3.2 Tools for design: mood boards, concept boards, CAD systems 3.3 Prototype creation and sampling 3.4 Interaction between material choice and product performance 3.5 Case studies in apparel, home textiles, and technical textile design	9	20

4. **Product Development Workflow and Commercialization**	4.1 Steps: concept, design, sampling, testing, refinement, production 4.2 Manufacturing feasibility: cost, production constraints, scalability 4.3 Quality evaluation of developed products 4.4 Supply chain and sourcing for new textile products 4.5 Branding, packaging, and documentation (technical specification sheets)	12	27
5. **Sustainability, Emerging Technologies, and Future Directions**	5.1 Sustainable fibres, dyes, finishes, and eco-design approaches 5.2 Circular product design and recycling concepts 5.3 Integration of advanced technologies: smart textiles, conductive materials, wearable electronics 5.4 Industry 4.0 in textile product development 5.5 Global trends and innovation challenges in the textile sector	9	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	**35**	**25**	**10**	**05**	**05**

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. L Horne (2012) New Product Development in Textiles, Woodhead Publishing, ISBN 978-1-84569-538-5 (print)
2. Yehia Elmogahzy, Engineering Textiles : Integrating the design and Manufacture of Textile Products (2019), The Textile Institute Series : Elsevier, ISBN: 9780081024881

(b) Open source software and website:

1. https://textilelearner.net/new-product-development-in-textile-industry/
2. https://www.cottoninc.com/quality-products/textile-research/product-development/

3. https://www.granthaalayahpublication.org/ojs-sys/ijoest/article/download/IJOEST_227/157/999
4. https://textileengineering.net/new-product-development-process-in-textile-and-apparel-industry/
5. https://techpacker.com/blog/design/the-ultimate-guide-to-product-development-in-fashion/

Suggested Course Practical List:

Experiment 1: Fibre Identification and Selection

Identification of natural and synthetic fibres using burning and microscopic tests. Prepare a chart linking fibre properties with potential product applications.

Experiment 2: Yarn Analysis for Product Suitability

Measurement of yarn linear density, twist, and tensile properties. Recommend suitable yarns for specific textile products (e.g., denim, hosiery, upholstery).

Experiment 3: Fabric Structure Identification

Examine woven, knitted, and nonwoven structures using a pick glass/microscope. Record constructions and identify their end-use suitability.

Experiment 4: Analysis of Fabric Performance Parameters

Testing of GSM, thickness, drape, air permeability, or absorbency. Interpret results in relation to product performance.

Experiment 5: Preparation of a Mood Board

Develop a theme-based mood board using colour palettes, textures, images, and material samples for a chosen textile product category.

Experiment 6: Concept Board and Idea Development

Translate the mood board into concept sketches for apparel, home textile, or technical textile products.

Experiment 7: Fabric Selection for a Designed Product

Select appropriate materials for the proposed design based on performance, handle, and aesthetic requirements. Justify choices.

Experiment 8: Introduction to CAD for Textile Design

Create basic fabric or motif designs using CAD software (weave/knit/CAD print depending on facility availability).

Experiment 9: Basic Pattern Drafting (Apparel Product)

Draft simple patterns (e.g., tote bag, pillow cover, basic T-shirt front) to understand scale and design-to-pattern translation.

Experiment 10: Prototype Development (Small Textile Product)

Develop a prototype such as a small bag, cushion cover, table mat, or simple garment panel. Document steps and specifications.

Experiment 11: Evaluation of Comfort and Aesthetic Properties

Assess the drape, handle, stiffness, and appearance of the prototype materials. Compare outcomes with initial design requirements.

Experiment 12: Preparation of a Technical Specification Sheet (Tech Pack)

Prepare a complete specification sheet including material details, dimensions, construction parameters, and quality requirements.

Experiment 13: Cost Estimation of a Textile Product

Calculate raw material cost, processing cost, labour cost, and final estimated product cost for the prototype.

Experiment 14: Mini Project – Product Development Report

Each student develops a small textile product (apparel/home/functional) and submits a report covering:

- Concept and design development
- Material selection
- Prototype preparation
- Evaluation and costing

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Microscope (digital/compound): To identify different types of fibers.
2	Fibre length measurement: Digital fibrograph: To determine the span length of cotton fibre, Electronic Fibre Length Tester, based on Opto -electronic scanning unit, High speed sensing device, calibrate with calibration cotton, Measuring Length upto 50mm, Span Length Measurement of 2.5%, 50%.
3	Fibre strength measurement: Stelometer: Determine the tensile strength or breaking tenacity and elongation of fibre bundle, Principle: constant rate of loading (CRL), Strength (breaking force) is measured from 2.0 to 7.0 kilogram, Elongation: 0 to 50 %, Gauge length: 0 and 1/8” (3.2 mm) ,Rate of loading : 1 kilogram per second.
4	Yarn twist tester: Continuous twist tester: Auto twist tester, Determine the twist of single ,double and open end yarn by untwist and twist principle, Specimen length adjustable 0-20",Selecion of S or Z twist, LCD display and provision to interface with printer, Feather touch operational keys, Specially designed yarn tensioning.
5	Yarn evenness tester: Uster evenness tester: evenness measurement of yarn, roving and sliver, capacitance principle, The CV% measured by Uster give a measure of variation

	of weight per unit length, measure the irregularity of material at high speed (2-100ft/min) and show both % of M.D and C.V. of material.
6	Lea strength tester: To determine the lea strength of yarn , Electronic Lea strength tester, Measure the lea strength by load cell and latest micro coprocessor technology, Wall mounted with rugged steel base , Load range : 0 - 500 lbs (0-250 kgs), Instrument fully controlled by micro controller, LCD display, Accessories - UPS 1.0 KVA
7	Electronic weighing balance: Determine the weight of Sliver , Roving and yarn , Capacity : 200 gm, Accuracy : 1 milligram , LCD display , Pan size: Minimum Ø 120 mm , with all calibrated weights.
8	Fabric Thickness Tester : Measuring range: 0 -10 mm, Accuracy :+/- 0.01 mm, Standard Pressure : 2kPa, Circular Foot, Diameter : 10-50 mm

Suggested Project List:

1. Prepare a detailed report on how to develop new products in textiles.
2. Prepare a detailed report on role of raw material in development of new products of textiles.
3. Study the important parameters for the textile product development.
4. Prepare a chart for stages of development process of different textile products.
5. Prepare comprehensive reports on Environmental concerns in new products development in textiles.
6. Product development using leftover fabric scraps.

Suggested Activities for Students: If any

1. Prepare comprehensive laboratory reports for newly developed textile products.
2. Prepare showcase portfolios of evaluation and comparison of available textile products in the market.
3. Internet survey regarding latest development in the area of newly developed Textiles.
4. Present a seminar on any relevant topic of Textile Product Design and Development.
5. Plan field trips to textile manufacturing facilities where students can witness the entire manufacturing process, from raw materials to finished products.

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