GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Textile Manufacturing Technology

Subject Code: DI04029011

Subject Name: Textile Testing - II

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

Prerequisite:	Basic knowledge of textile fibers, yarn and fabric manufacturing processes, along with elementary statistics, is required to effectively perform and interpret fabric testing.
Rationale:	Textile Testing-II course is designed to provide advanced knowledge and practical skills essential for evaluating fabric quality and performance. This course emphasizes the importance of standardized testing methods, sampling techniques, and classification of fabrics, which form the foundation of reliable test results. It equips learners to analyze physical and mechanical properties of fabrics such as strength, abrasion resistance, crease recovery, stiffness, and comfort, enabling them to link material properties with end-use performance. With the inclusion of modern instrumentation like HVI, AFIS, students gain exposure to state-of-the-art testing technologies widely used in the textile industry. The course also integrates Statistical Quality Control (SQC) methods to develop competency in data interpretation, ensuring accuracy, consistency, and quality assurance in textile products. This course bridge theoretical concept with industrial practices, preparing students for roles in quality control, R & D, and advanced textile testing laboratories.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
CO-1	Select the standard procedures for fabric testing along with sampling.	R,U,A
CO-2	Evaluate physical and mechanical properties of fabrics such as GSM, strength, abrasion, crease recovery, stiffness, drape, air permeability, and comfort.	R,U,A
CO-3	Apply knowledge of advanced textile testing instruments to determine fibre, yarn, and fabric quality parameters.	R,U,A
CO-4	Utilize statistical quality control tools and textile parameter units to interpret testing data and ensure product reliability.	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)	
2	0	4	4	70	30	20	30	150

Legends: ***L****-Lecture;* ***T****–Tutorial/Teacher Guided Theory Practice;* ***PR****-Practical;* ***C****–Credit,* ***CA****-Continuous Assessment;* ***ESE****-End Semester Examination.*

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.Introduction to Fabric Testing	**Introduction to Fabric Testing** 1.1 Importance and objectives of fabric testing. 1.2 General testing standards and conditions. 1.3 Quality parameters of Fabric. 1.4 Fabric sampling methods.	03	10%
2.Testing of Physical and Mechanical Properties of Fabric	**Testing of Physical and Mechanical Properties of Fabric** 2.1 Fabric dimensional properties: determination of fabric length, width, thickness and weight (GSM). 2.2 Fabric strength testing: Preparation of test samples, Methods of measuring tensile strength, Ravelled strip, cut strip and grab method, Fabric Tensile strength tester, The Elmendorf Tearing strength tester, Hydraulic Bursting Strength Tester. 2.3 Fabric abrasion resistance: Classification of abrasion, Factors affecting abrasion resistance testing, Assessment of abrasion damage, The B.F.T. abrasion Tester. 2.4 Pilling of fabrics: Factors responsible for Pilling, I.C.I Pilling box Tester. 2.5 Measurement of Air and water permeability: Air permeability, Air resistance, Air porosity, Shirley Air permeability Tester, Water permeability, shower proof, water proof, water repellent, Drop penetration Test, Spray Test, Shirley hydrostatic head test. 2.6 Measurement of flame resistance: Vertical Test, Inclined Test. 2.7 Fabric stiffness, handle and Drape: Parameters affecting handle of fabric, Drape meter, Shirley stiffness tester. 2.8 Measurement of Crease resistance and Crease recovery:	15	50%

	Crease recovery tester.		
3.Advancement in Textile Testing	**Advancement in Textile Testing** 3.1 Advanced HVI (High Volume Instrumentation) Systems: For detailed fibre properties like micronaire, length, strength, and colour in cotton. 3.2 AFIS (Advanced fibre Information System): Detects trash, neps, fibre maturity, and length distribution. 3.3 Universal Testing Machine (UTM). 3.4 Fabric Handle and Related Properties 1. Kawabata Evaluation Systems for Fabric (KESF) 2. Fabric Assurance by Simple Testing (FAST).	08	27%
4. Statistical Quality Control in Textile	**Statistical Quality Control in Textile Testing** 4.1 Introduction and need of S.Q.C. in textile. 4.2 International system of units for textile parameters. 4.3 Measures of Central tendency mean, median, mode and quartile. 4.4 Measures of dispersion. 4.5 Calculation of mean deviation, Standard deviation and C.V.%	04	13%
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**30**	**20**	**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. Principles of Textile Testing, J. E. Booth, CBS Publishers AND distributors PVT LTD 1996 New Delhi India (15 September 2018) ISBN 10:81-239-0515-7, ISBN-13: 978-8123905150
2. Textile testing, P. Angappan & R. Gopalakrishnan, S.S.M.I.T.T Staff and students' Co-op Stores Ltd, Valayakkaranoor, Tamil Nadu 2002
3. Testing and Quality Management, V. K. Kothari, IAFL Publications, New Delhi-ISBN 819010330X,9788190103305
4. Handbook of Textile Testing and Quality Control, E. B. Grover and D. S. Hamby,

Textile book publishers 1960-Technology and engineering the university of michigari.
5. Textile Testing and Analysis, Collier, Billie J- PHI Learning, New Delhi ISBN-100134882148, ISBN-13978-0134882147.
6. Testing of Textile and Fibrous Materials, Apurba Das, 2024, Boca Raton CRC Press, ISBN 9781003453642.

(b) Open-source software and website:

1. https://archive.nptel.ac.in/courses/116/102/116102029/
2. https://archive.nptel.ac.in/courses/116/102/116102049/
3. https://textilestudycenter.com/
4. http://www.uster.com/en/instruments/fiber-testing/uster-hvi/
5. http://www.atira.in/Testing.aspx/
6. https://www.onlinetextileacademy.com/category/textile-testing/
7. https://textilelearner.net/different-types-of-textile-testing-methods/
8. https://textilestudycenter.com/library/

Suggested Course Practical List:

1. Demonstration of fabric sampling methods.
2. Analysis of factors affecting fabric sampling and preparation of samples.
3. Determination of fabric thickness and weight (GSM).
4. Measurement of tensile strength of fabric.
5. Determination of tearing strength of fabric.
6. Determination of bursting strength of fabric.
7. Evaluation of abrasion resistance of fabric.
8. Measurement of crease recovery and crease resistance of fabric.
9. Determination of drape of the fabric.
10. Determination of Stiffness of the fabric.
11. Determination of air permeability and air resistance of the fabric.
12. Measurement of water permeability and water resistance of the fabric.
13. Determination of mechanical properties of fabric using Kawabata Evaluation System (KES-F).
14. Determination of fabric dimensional and performance properties using Fabric Assurance by Simple Testing (FAST) system.
15. Demonstration of HVI (High Volume Instrument) testing of cotton fibre.
16. Determination of fibre properties using AFIS (Advanced Fibre Information System).
17. Application of measures of central tendency and dispersion in textile test data.

Minimum 14 Practical Exercises

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Fabric tensile strength tester: To determine grab and strip strength of fabric.
2	Fabric tearing strength tester: Determine the tearing strength of fabric, Maximum capacity up to 6.4 kg with adjustable cutting knife, Variable capacity 1.6 Kgs, 3.2 kgs, 6.4 kg different fabric, Complete with accessories three calibration weights 1 sample making weights ,1 extra cutting blade and dust cover.
3	Fabric Bursting Strength Tester: Determine the bursting strength of fabric, Capacity: 35 Kg/Sq. Cm, Latest design with digital control panel, Maximum capacity 35 kg/ sq cm, Glycerine used as test fluid, Complete with all accessories including calibrated aluminium foil for calibration, Two diaphragms, & a clamp opening vice.
4	Fabric Drape meter: To determine the draping /hanging phenomenon of fabrics, Smooth precision engineered components for excellent performance,1000W halogen lamp used for exposure, Sample Cutting template of 250mm diameter, having a centre hole for marking and cutting test specimen is supplied, With developing chamber, Supplied with manual where calculation for drape co efficient is given, Complete with all accessories Halogen Light Source, Cutting Template, 1Roll of Ammonia Paper.
5	Fabric Crease recovery tester: To determine Crease recovery of fabric, It is measured quantitatively in terms of crease recover angle, Made of heavy caste base with all parts of stainless steel, Size of test specimen: 40mm X 15mm, Creasing load: 1 kg (Stainless steel), Angle measurement: On an Engraved circular scale graduated in 1 deg. Angle, Scale measurement: 0 - 180 degree.
6	High volume instrument (HVI): To determine fibre properties namely length, strength, Length uniformity, elongation, micronaire, color, trash, Fully automatic sample preparation, auto combing and brushing for length and strength measurement. Testing speed within 26 – 30 seconds at each test of all 8 parameters.
7	Advance fibre information system(AFIS): To determine the important characteristics of cotton materials namely Card nep analysis, length applications, Card wire maintenance analysis, Length applications, Length analysis of comber and draw frame, Trash content analysis ,based on aeromechanical fibre processing, similar to opening and carding, followed by electro-optical sensing and then by high speed microprocessor based computing and data reporting.

Suggested Project List:

a) **Introduction to Fabric Testing**:

- Prepare project on comparative study of fabric sampling methods and techniques.
- Analysis of factors affecting fabric sampling in woven and knitted fabrics.

b) **Testing of Physical and Mechanical Properties of Fabric:**

- Determination of GSM and thickness of different types of fabric.
- Experimental study on tensile, tearing, and bursting strength of fabrics.
- Evaluation of abrasion resistance, pilling tendency and crease recovery of fabrics.
- Study on drape and stiffness properties of woven and knitted fabrics.
- Assessment of air permeability and water repellency for comfort analysis.

c) **Advancement in Textile Testing**

- Application of HVI systems for testing of cotton fibre properties.
- Comparative analysis of AFIS and HVI results for fibre maturity and trash content.
- Study on fabric surface friction and roughness using KES-F parameters.
- Measurement of fabric drape and formability through FAST system.

d) **Statistical Quality Control in Textile**

- Application of statistical tools for analyzing fabric strength test results.
- Study of central tendencies and dispersion in textile testing data.
- Development of control charts for textile quality monitoring.
- Case study on implementation of SQC in a textile testing laboratory.

Suggested Activities for Students:

a) Prepare comprehensive laboratory reports for the textile tests they perform.
b) Assignments on latest innovations and trends in textile testing.
c) Evaluate and compare textile products in the market, assessing their quality and compliance with testing standards.
d) Arrange visits to textile testing laboratories or facilities where students can observe and learn about the latest testing equipment and techniques.
e) Plan field trips to textile manufacturing facilities where students can witness the entire manufacturing process, including testing procedures, from raw materials to finished products.
f) Assignment structured according to specific topics, with a focus on internet-based content.
g) Present a seminar PPT on any of relevant topic of the Textile testing.
h) Explore library/internet facilities for preparing report on fibre, yarn and fabric testing.

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