GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Manufacturing Technology

Course / Subject Code: DI03029051

Course / Subject Name: Textile Testing-I

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	This course includes the study of the impact of humidity on textile materials, as well as fibre and yarn testing parameters. Familiarity with fundamental textile concepts will help students effectively grasp the testing techniques and interpret the results accurately.
Rationale:	The *Textile Testing-I* course is designed to provide foundational knowledge and practical skills in key areas of textile quality assessment. It covers essential topics such as humidity measurement, fibre testing parameters, and yarn testing parameters. These areas are critical for ensuring the quality and consistency of textile materials. Understanding the impact of humidity on testing, as well as mastering standard methods for evaluating fibres and yarns, equips students with the competencies needed to identify defects, maintain production standards, and meet customer expectations. This course lays the groundwork for more advanced textile testing and plays a vital role in the technical education of aspiring textile engineers.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
CO-1	Make use of various sampling techniques in textile testing.	A,R,U
CO-2	Explain the concept of relative humidity and analyze its impact on the physical and mechanical properties of fibres and yarns.	A,R,U
CO-3	Test the different fibre quality parameters using the relevant fibre testing instruments.	A,C,E.R,U
CO-4	Measure yarn count, twist and irregularity using the relevant yarn testing instruments.	A,R,U

**Revised Bloom's Taxonomy (RBT)*

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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 of Textile Testing	**Introduction of Textile Testing** 1.1 Need and Objectives of testing. 1.2 Sampling methods: random sampling, biased sampling. 1.3 Sampling techniques: square, cut square, zoning technique, yarn sampling. 1.4 Factors affecting the sampling.	04	15%
2. Moisture Relation and Testing	**Moisture Relation and Testing** 2.1 Standard atmospheric conditions for testing. 2.2 Humidity and its importance in textiles. 2.3 Absolute & relative humidity. 2.4 Moisture regain & moisture content. 2.5 Measurement of moisture regain & content. 2.6 Factors affecting the regain, Effects of regain on fibre properties. 2.7 Correct numerical weight, Conditioning oven method, shirley moisture meter	04	15%

3. Fibre Testing & Instruments	**Fibre Testing & Instruments** 3.1 Fibre length measurement: Importance, determination, fibre length parameter, baer sorter, digital fibrograph. 3.2 Fibre strength measurement: Stelometer- Pressley Bundle fibre 3.3 Fibre Fineness Measurement: Importance, different method of measuring, Airflow method, Sheffield Micronaire Tester, ATIRA fineness tester. 3.4 Fibre maturity: Importance, determination of maturity, Caustic soda swelling method 3.5 Trash content in cotton fibres: Determination of trash content in cotton, Shirley Trash Analyser.	12	35%
4. Yarn Testing & Instruments	**Yarn Testing & Instruments** 4.1 Yarn count testing: yarn numbering system, conversion methods, measurement of yarn number, Instrument used - Quadrant Balance, Knowles Balance, Beesley balance and Wrap Reel. 4.2 Yarn Twist Testing: Type of twist, Effect of twist on fabric property, Different methods of twist measurement. -The straightened fibre method- Untwist/Retwist Method- Untwist/Retwist Method - Twist contraction method, Continuous Twist Tester, Take-up twist tester. 4.3 Yarn Strength Testing: The concept of yarn rupture, types of tests- single thread, lea testing, types of testers and their principles of working (pendulum, inclined plane etc.), types of testing (CRT, CRL and CRE), the effect of gauge length (the weak link theory etc.) 4.4 Yarn evenness Testing: Classification of variations, causes of yarn irregularity, Different method of measuring yarn evenness, Uster evenness tester.	10	35%
	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-10 0134882148, ISBN-13 978-0134882147.

(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. Selection of sample by Zoning Technique.
2. Determination of Moisture regain by Conditioning Oven Method
3. Measure the fibre length parameters using Baer sorter.
4. Determine the fibre length parameters using digital Fibrograph.
5. Measure the Fibre strength parameter using Stelometer.
6. Measure the Fibre strength parameter using Presslley bundle strength tester.
7. Determine the Fibre fineness parameter using Sheffield Micronaire tester.
8. Measurement of Maturity of cotton by caustic soda method.
9. Measure the count of yarn using wrap reel.
10. Determination of yarn count by Knowles balance, Quadrant balance and Beesley Balance
11. Determine the yarn twist parameter using Continuous Twist Tester.
12. Determination of single yarn twist by Untwist/Retwist Method.
13. Determination of Double yarn twist by Take-up twist tester.

14. Determine the yarn evenness using Uster evenness tester.
15. Determination of yarn strength by the single thread strength tester.
16. Determine the count strength product (CSP) using lea strength tester.
17. Solve problems on Indirect system of yarn number.
18. Solve problems on Direct system of yarn number.

Minimum 15 Practical Exercises

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Fibre length measurement: Baer sorter: provided with 12 bottom combs and 3 top combs, imported needles brazed on brass strips, Standard accessories like velvet pad & tweezers.
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	Fiber fineness Tester with weighing scale: Sheffield Micronaire Tester: Determine the fineness value of cotton fibres in terms of micrograms per inch, Measuring Principle : Airflow Method, Measuring Range : 2.0 to 6.0 Micronaire , Measuring Accuracy : ± 0.1 Micronaire, Sample size : 4 grams ± 0.01 gram, Weighing scale : Capacity : 100 grams / Accuracy : 0.01 gram, Built-in calibration mode, Display : LED display
5	Wrap reel: Minimum 5 skeins at a time, Perimeter 1.5 yds and Bobbin holding stand.
6	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.
7	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.
8	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.

9	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.

Suggested Project List:

a) **Sampling**: Prepare comparative chart or report on types of sampling, methods of fiber yarn and fabric sampling technique. Collect sample of fiber, yarn and fabric for testing.
b) **Fiber testing**: To analyze and compare the fiber length, strength, fineness, and moisture content of different types of fibers (e.g., natural, and synthetic fibers.), Prepare report, chart or small model on different fiber testing instrument.
c) Yarn testing: Investigate the influence of twist on the properties of yarn and to determine the optimal twist for desired characteristics. To systematically investigate and analyze the key properties of yarn, including twist, strength, and linear density, and to understand the interplay between these factors, Prepare report, chart or small model on yarn tensile testing instrument.

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) Prepare internet based assignment course topic wise.
i) Explore library/internet facilities for preparing report on fibre, yarn and fabric testing.

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