



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Textile Engineering

Subject Code : ME02025091

Subject Name : Testing of Technical Textiles

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

<b>Prerequisite:</b>	Basic knowledge of technical textile and testing at BE level
<b>Rationale:</b>	This course covers the specific test methods of various technical textile materials, like extreme heat, fire and cold protective clothing, geo textiles, filter fabrics, fibre reinforced composites, electromagnetic shielding textiles and compression bandages, ballistic protective textiles, UV protective textiles, and analysis of test results have been discussed in details.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Design the strategy of sampling and testing of technical textile materials.	R,U,A
02	Understand the principles of technical textile materials	R,U
03	Evaluate technical textiles based on standards	U,A,E
04	Analyse the results of testing of textile materials	U,A,E
05	Draw inferences about the quality of technical textile materials from the test results	U,A,E

\*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
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150



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## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Objectives of testing for functional and technical textiles, Advanced material testing like NMR, XRD, Infrared Spectrum, DSC, birefringence, sonic modulus, Single fibre strength testers, testing for filaments etc.	8	20
2.	Testing of nonwoven structures: gsm, thickness, fibre orientation, air permeability, porosity, pore size, pore size distribution, pore shape, absorption.	6	14
3.	Testing of geotextiles: Tensile strength, Burst Strength, Impact strength, Compressibility, Puncture resistance, pullout test. Hydraulic properties of geo-textile: Apparent opening size, Cross plane permeability, In plane permeability, Long term permeability, Gradient ratio.	6	14
4.	Testing of filter fabrics: Filtration standards, Filtration properties like: Filtration efficiency, penetration, beta ratio, pressure drop, permeability, filter life Physical Properties: grammage, density and bulk, solidity and porosity, pore structure, dimensional stability, Mechanical Properties: tensile, tear, bursting.	6	14
5.	Composites lamination testing: Tensile properties, Impact properties, Flexural properties, compression behavior, fibre matrix bonding, Interlaminar strength, Density and void content.	6	14
6.	Testing of ballistic textile: Dynamic impact test, Weapon test (Residual velocity), NIJ standard, V50 measurement, Back face signature test.	4	10
7.	Testing of extreme heat, fire and cold protective clothing, testing of UV protective textiles, Testing of electromagnetic shielding textiles.	6	14
<b>Total</b>			<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	20	5	5	5



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*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. Physical Testing of Textiles by B. P. Saville, 1999, Woodhead Publishing Ltd., U.K.
2. Principles of Textile Testing by J. E. Booth, 1961, Heywood Books, London.
3. Testing and Quality Management – Edited by V. K. Kothari, IAFL Publications, New Delhi.
4. Science in Clothing Comfort, Apurba Das and R. Alagirusamy, Woodhead Publishing India Ltd., 2010.
5. The Thermal Behaviour of Textiles, K. Slater, Textile Progress, Vol. 8, No. 3, 1976.
6. Comfort Properties of Textiles, K. Slater, Textile Progress, Vol. 9, No. 4, 1977.
7. Handbook of Technical Textiles, Edited by A R Horrocks and S C Anand, The Textile Institute, CRC Press.
8. Wellington Sears Handbook of Technical Textiles, Sabit Adanur, Technomic Publishing Co. Inc.
9. Handbook of Fibre Rope Technology, H A McKenna, J WS Hearle and N O'Hear, The Textile Institute, CRC Press
10. Handbook of Textile Testing and Quality Control by E. B. Grover and D. S. Hamby.
11. Textile Testing by Angappan P & Gopalakrishnan R, SSM Institute of Textile Technology, Komarapalayam, 2002.
12. Textile Testing by Basu A, SITRA Coimbatore, 2002.

### **(b) Open source software and website:**

<http://nptel.iitm.ac.in>, World Wide Web, Google Search Engine etc.

## **Suggested Course Practical List:**

1. Study the testing and characterization of high performance fibre.
2. Measure the pore size and pore size distribution of nonwoven fabric.
3. Study the tensile, puncture and burst properties of geotextile material.
4. Study the properties of filter fabric.
5. Study the testing and characterization of composite laminates.
6. Study ballistic protective testing using various methods.



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7. Measure the thermal properties of fabric.
8. Measure the electromagnetic shielding properties of textile.
9. Study UV radiant protective testing using various methods.

### **List of Laboratory/Learning Resources Required:**

X-ray diffraction, Scanning Electron Microscope, Optical Birefringence, Nuclear Magnetic Resonance, Extension gauge, Electronic balance, Guarded hot plate, Togmeter, UV radiant, Ballistic tester, Air filtration, Screw dust feeder, Tensile tester for technical textile, CBR burst tester, Mullen burst tester, CBR puncture tester, Impact tester.

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