GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3172916
Semester: VII
Subject Name: Advanced Textile Testing

Type of course : Professional Elective Course

Prerequisite : Basic Knowledge of Textile Testing.

Rationale : Nowadays various developments in the textile fields open the opportunity for research and development of existing and new products for the textile industry. Advance testing is helpful tools for quality control, analyzing, selection of raw materials, product development, product quality control, process development and product testing for research and development of the next generation product from textile materials.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	4	5	70	30	30	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Content	Total Hrs
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.	10
2	Advanced testing for yarns like friction of yarn, applications of Tensojet, Classimat etc. Modern methods of Testing for irregularities and interpretation of data.	6
3	Fabric Objective evaluation methodologies like Kawabata & FAST.	4
4	Testing of Transmission characteristics Moisture transmission (Vapour form and Liquid form). The transmission, Testing of extreme heat, fire and cold protective clothing, testing of UV protective textiles, Testing of electromagnetic shielding textiles.	8
5	Testing of fibre reinforced composites, Testing of ballistic textile: Dynamic impact test, Weapon test (residual velocity) NIJ standard, V_{50} measurement, Back face signature.	6
6	Testing of geotextiles: Tensile strength, Burst Strength, Impact strength, Compressibility, Puncher resistance, pullout test, Testing of filter fabrics : Air filtration apparatus, screw dust feeder, filtration parameters.	8

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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	30	5	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference 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 Horrocksand 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 Press11. Online sources on testing of technical textiles.
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.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Describe the different advanced properties of fibre, yarn and fabric.	40
CO-2	Describe the different properties related to the comfort of fabric and protective fabric.	20
CO-3	Explain the different properties of fibre reinforced composites and ballistic textile.	20
CO-4	Explain the different tests related to the geotextile and filter fabric.	20

List of Experiments:

1. To study crystal size and crystallinity of fibres using X-ray diffraction.
2. To examine the surface of fibre using SEM.
3. To identify the presence of groups in molecule using infrared radiation.

4. To study orientation of fibres using birefringence.
5. To study the crystalline and amorphous region with matrix rigidity using NMR.
6. To study the properties using FAST system.
7. To study the properties using Kawabatta system.
8. To study water vapour transmission using permetest and togmeter method.
9. To study thermal properties using guarded hot plate method.
10. To study ballistic protective testing using various methods.
11. To study UV radiant protective testing using various methods.
12. To study the properties of filter fabric using air filtration method and screw dust feeder.
13. To study the tensile properties geotextile material.
14. To study the puncher properties geotextile material using CBR puncher tester.
15. To study the burst properties geotextile material using CBR tester and Mullen tester.
16. To study the impact properties of reinforced composites using Dynamic impact test.

Major Equipment:

X-ray diffraction, Scanning Electron Microscope, Optical Birefringence, Nuclear Magnetic Resonance, Extension gauge, Electronic balance, and necessary glass wares, Dry and Wet bulb hygrometer (or any other hygrometer), Guarded hot plate, Togmeter, UV radiant, Ballistic tester, Air filtration, Screw dust feeder, Tensile tester for geo textile, CBR burst tester, Mullen burst tester, CBR puncture tester, Impact tester, Chemical oven/ Moisture meter, Dynafil Tester.

List of Open Source Software/learning website :

http://nptel.iitm.ac.in, World Wide Web, Google Search Engine etc., Various Web sites of textile testing instrument manufacturers, BIS, BS, ASTM and other standard methods of textile testing.