

# **Syllabus for Multi-Disciplinary Minor Degree**

**In**

## **Fibres and Textile Processing Technology Under the National Education Policy (NEP 2020)**



**Offered by**

### **DEPARTMENT OF FIBRES AND TEXTILE PROCESSING TECHNOLOGY**

#### **INSTITUTE OF CHEMICAL TECHNOLOGY**

**(University Under Section-3 of UGC Act, 1956)**

**Elite Status and Center for Excellence**

**Government of Maharashtra**

**Nathalal Parekh Marg, Matunga, Mumbai 400 019 (INDIA)**

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**A. Preamble:**

The Textiles department is the first and only premium institute specifically dedicated to studying various aspects of Textile wet processing and conducting in-depth research to provide feasible techno-commercial solutions to ever-evolving industrial needs. The department is closely working with various industries involved in fibre and yarn manufacturing, fabric processing and garment making, colourant and auxiliary chemical producing, instrument and equipment making, fashion designing, and branding. The courses offered in this Minor program in Fibres and Textile Processing Technology involve the study of chemistry and manufacture of fibres, and their chemical processing such as bleaching, dyeing, printing, and finishing. It further encompasses the application of various kinds of chemicals, dyes, thickeners, and finishing auxiliaries which are used in chemical processing of apparel, home furnishing, and technical textiles.

The students will have the opportunity of combining knowledge of their major with the knowledge of textile fibres, polymers, and textile wet processing technology to improve their marketability to employers and consider higher studies in textile fibres and materials-related fields.

#### B. PROGRAM SPECIFIC OUTCOMES (PSOs)

<b>PSO1</b>	<b>Fundamentals of Textile Wet Processing:</b> Able to understand and explain various dyes and auxiliaries requirements for textile wet processing.
<b>PSO2</b>	<b>Application of textile processing knowledge:</b> Able to apply fundamental knowledge of textile wet processing in coloration and functionalization of textile materials.
<b>PSO3</b>	<b>Textile material analysis:</b> Able to analyze and classify different fibers and polymers for yarn and fabric forming technology.
<b>PSO4</b>	<b>Developing sustainable textile material:</b> Able to develop sustainable textile material that meets the specified needs with appropriate environmental considerations.
<b>PSO5</b>	<b>Evaluation of textile products:</b> Able to apply different analytical methods for testing textiles, measurement, and assessment of performance properties of textiles

**C. Intake:** Minimum 15; Maximum 35

#### D. Eligibility criteria:

Students enrolled in B.Chem. Engg and BTech programmes of Institute of Chemical Technology will be eligible. The enrolment into the minor degree programme will be as per the policy of the Institute.

**E. Prerequisites:** First Year B. Tech/B. Chem Engg subjects

#### F. PEDAGOGY/TEACHING METHOD:

**Lecture/Discussions:** These sessions will discuss the subject matters of the course.

**Experiential Learning:** The sessions will involve hands on training.

**Tutorials:** Problem solving / case studies / relevant real-life applications / students presentations / home assignments / individual or group projects.

### G. Structure of the Multidisciplinary Minor Courses:

Multidisciplinary Minors: Fibres and Textile Processing Technology										
Semester	Course Code	Subject	Credits	Hrs./Week			Marks for various Exams			
				L	T	P	CA	MS	ES	Total
SEM-III	TXT110	Introduction to Textile Substrates	2	1	1	0	20	30	50	100
SEM -IV	TXT121	Introduction to Textile Wet Processing	2	1	1	0	20	30	50	100
SEM -V	TXP102	Textile Wet Processing Lab 1 (pretreatment, dyeing, printing)	4	0	0	8	50	00	50	100
SEM -VI	TXT121	Chemistry and application of speciality chemicals	2	1	1	0	20	30	50	100
SEM -VII	TXT130	Testing of textile materials	2	1	1	0	20	30	50	100
SEM -VIII	TXP102	Textile Wet Processing Lab 2 (finishing, testing)	2	0	0	4	50	00	50	100
		<b>TOTAL</b>	<b>14</b>	4	4	12				600

### H. Evaluation:

Course	Course code	Subject	Method of Evaluation	Methods of Delivery
SEM-III	TXT1107	Introduction to Textile Substrates	<ul style="list-style-type: none"> <li>Two continuous assessment tests</li> <li>Assignments</li> </ul>	<ul style="list-style-type: none"> <li>Lectures/Face to face training</li> <li>Tutorials</li> <li>Case studies</li> <li>Presentation</li> </ul>
SEM -IV	TXT1218	Introduction to Textile Wet Processing	<ul style="list-style-type: none"> <li>Two continuous assessment tests</li> <li>Assignments</li> </ul>	<ul style="list-style-type: none"> <li>Lectures/Face to face training</li> <li>Tutorials</li> <li>Case studies</li> <li>Presentation</li> </ul>
SEM -V	TXP1022	Textile Wet Processing Lab 1 (pretreatment, dyeing, printing)	<ul style="list-style-type: none"> <li>Continuous evaluation on assigned Job.</li> <li>Skill based-practical exam.</li> <li>Journal/Report submission</li> <li>Viva</li> </ul>	<ul style="list-style-type: none"> <li>Hands on Training</li> <li>Projects (Individual/group)</li> </ul>
SEM -VI	TXT1216	Chemistry and application of speciality chemicals	<ul style="list-style-type: none"> <li>Two continuous assessment tests</li> <li>Assignments</li> <li>Seminar/ Presentation</li> </ul>	<ul style="list-style-type: none"> <li>Lectures/Face to face training</li> <li>Tutorials</li> <li>Case studies</li> </ul>

				<ul style="list-style-type: none"> <li>• Presentation</li> </ul>
SEM -VII	TXT1301	Testing of textile materials	<ul style="list-style-type: none"> <li>• Two continuous assessment tests</li> <li>• Assignments</li> <li>• Seminar/ Presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Lectures/Face to face training</li> <li>• Tutorials</li> <li>• Case studies</li> <li>• Presentation</li> </ul>
SEM -VIII	TXP1023	Textile Wet Processing Lab 2 (finishing, testing)	<ul style="list-style-type: none"> <li>• Continuous evaluation on assigned Job.</li> <li>• Skill based-practical exam.</li> <li>• Journal/Report submission</li> <li>• Viva</li> </ul>	<ul style="list-style-type: none"> <li>• Hands on Training</li> <li>• Projects (Individual/group)</li> </ul>

#### I: Faculty/Instructor (Tentative)

Semester	Course Code	Subjects	Faculty
SEM-III	TXT1107	Introduction to Textile Substrates	Prof. Kale/ Dr. Maiti
SEM -IV	TXT1218	Introduction to Textile Wet Processing	Prof. Adivarekar/ Prof. Athalye
SEM -V	TXP1022	Textile Wet Processing Lab 1 (pretreatment, dyeing, printing)	Dr. Biranje/ Dr. Badhe
SEM -VI	TXT1216	Chemistry and application of speciality chemicals	Dr. More
SEM -VII	TXT1301	Testing of textile materials	Dr. Kulkarni/Dr. Maiti
SEM -VIII	TXP1023	Textile Wet Processing Lab 2 (finishing, testing)	Dr. Biranje/ Dr. Badhe

#### J. Detailed syllabus:

<b>Course Code:</b> TXT1107	<b>Course Title: MDM-I</b> Introduction to Textile Substrates	<b>Credits = 2</b>		
		<b>L</b>	<b>T</b>	<b>P</b>
<b>Semester: III</b>	<b>Total contact hours: 30</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>List of Prerequisite Courses</b>				
First Year BTech/BChem Engg				
<b>List of courses where this course will be prerequisite</b>				
TXT1218: Introduction to Textile Wet Processing, TXP1022: Textile Wet Processing Lab 1, TXP1023: Textile				

Wet Processing Lab 2		
<b>Description of the relevance of this course in the MDM in Fibres and Textile Processing Technology</b>		
Students will have a better understanding of different natural and synthetic fibres, their properties, as well as an important concept of polymer chemistry, which will help in manufacturing as well as designing processing parameters.		
<b>Sr. no.</b>	<b>Course Contents (Topics and subtopics)</b>	<b>Reqd. hrs</b>
1.	Introduction to textile fibres and polymers, Fibre forming characteristics of polymers, Definition of various basic textile terms, Introduction to Fibre, Yarn, Fabric, Classification of fibres based on sources of origin and on chemical constitution.	<b>4</b>
2.	Natural fibres of plant, animal and mineral origin, chemistry, morphology, physical and chemical properties, structure property relationship with application, commercially important fibres like cotton, jute, linen, bamboo, wool, silk etc., Fibre to fabric conversion steps.	<b>7</b>
3.	Semi-synthetic fibres such as viscose rayon, cuprammonium rayon, acetate rayon, bamboo rayon and lyocell with respect to chemistry, manufacturing process, morphology, physical and chemical properties, and structure property relationship with applications.	<b>5</b>
4.	Synthetic fibres such as polyester and its variants, polyamides, acrylic, polypropylene, etc with respect to their raw materials, synthesis, manufacturing processes including LOY, FOY, POY, FDY, draw ratio, physical and chemical properties, and applications.	<b>5</b>
5.	Manufacturing yarn: Introduction of spinning, Primary properties of textile fibres, Physical properties of Cotton, Silk, Wool. Fineness measurement of Filament and Yarn. Process comparison of staple spinning and filament spinning.	<b>3</b>
6.	Manufacturing of Fabric: Introduction to fabric manufacturing, types of manufacturing, weaving, knitting and non-woven.	<b>3</b>
7.	Numerical – Fineness, Moisture percentage, Motion transfer in gears and rollers, Drafting and doubling, Twist, Fabric production, Cover factor, statistical analysis.	<b>3</b>
<b>Total</b>		<b>30</b>
<b>List of Textbooks/ Reference Books</b>		
1.	Textile Fibres, Shenai V.A., Vol-1, Sevak Publications, Bombay, 3rd edition, 1991.	
2.	Mishra, S. P. A Textbook of Fibre Science and Technology. India: New Age International, 2000	
3.	Ghosh, P. Fibre Science and Technology. United States: McGraw Hill Education (India) Private Limited, 2004	
4.	Kothari, V. Manufactured Fibre Technology. Netherlands: Springer Netherland, 2012	
5.	Visco-Elastic Properties of Polymers, Ferry, J.D., John Wiley and Sons, New York, 3 <sup>rd</sup> edition, 1980	
6.	Polymer Science, V R Gowariker, New Age international (P) Ltd Publications, New Delhi, 1986	
7.	Weaving: Machines, mechanisms, management, Talukdar, M.K., Sriramulu P.K., Ajaonkar D.B., Mahajan Publishers Private Ltd., Ahmedabad, 1998	
8.	Knitting technology, D. B. Ajaonkar, Universal Pub, 1998	
9.	Nonwovens - Process, Structure, Properties and Applications; T Karthik, 2017	
<b>Course Outcomes (students will be able to.....)</b>		

CO1	<b>Understand</b> fibre-forming properties with different textile terms and their classification (K2).
CO2	<b>Acquire</b> deeper understanding and insights into basic chemistry, production processes and physical and chemical properties of Natural and Synthetic fibers. (K2).
CO3	<b>Calculate</b> yarn and fabric production related numerical. (K3)
CO4	<b>Analyze</b> designs of various type of fabrics and different types of defects in fabric. (K4)

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs)</b>						
		<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	<b>K2</b>	3	3	2	1	1
<b>CO2</b>	<b>K2</b>	2	1	3	2	3
<b>CO3</b>	<b>K3</b>	1	1	3	2	2
<b>CO4</b>	<b>K4</b>	1	1	3	2	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution  
 K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

<b>Course Code:</b> <b>TXT1218</b>	<b>Course Title: MDM-II</b> <b>Introduction to Textile Wet Processing</b>	<b>Credits = 2</b>		
		<b>L</b>	<b>T</b>	<b>P</b>
<b>Semester: IV</b>	<b>Total contact hours: 30</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>List of Prerequisite Courses</b>				
TXT1107: Introduction to Textile Substrates				
<b>List of courses where this course will be prerequisite</b>				

TXP1022: Textile Wet Processing Lab 1, TXP1023: Textile Wet Processing Lab 2

**Description of the relevance of this course in the MDM in Fibres and Textile Processing Technology**

Students will have better understanding of various stages of textile wet processing and gain a basic idea about the wet processing operations.

Sr. No.	Course Contents (Topics and subtopics)	Reqd. hrs
1.	Pretreatment: Basic operations in textile wet processing – overall sequence, an overview of textile types and chemicals used, Singeing, Desizing, Scouring and Bleaching, Mercerization, Pretreatment of Blends.	5
2.	Dyeing: Parameters of quality dyeing, Classification of dyes based on application, Performance characteristics of dyed textiles. Machinery for dyeing of textiles in various forms such as fibres, yarns, woven and knitted fabric.	10
3.	Printing: Introduction to various colouration technics, Stages in the printing of textiles, and History of textile printing. Preparation of print paste, functions of various ingredients of print paste, classification of thickeners, Preparation of stock thickening, Selection of thickening agents based on dye class, style and method, Styles of Printing and various special styles of printing	10
4.	Finishing of Textile: Objective of textile Finishing and type of finishing techniques, Mechanical finishes like Calendaring, sanforising. Chemical finishing – conventional softeners, stiffeners, binders, weighting agents, silicone finishes, specialty finishes.	5
<b>Total</b>		<b>30</b>

**List of Textbooks/ Reference Books**

1.	Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar, 1999
2.	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol.3, 3rd edition, 2003.
3.	Technology of Dyeing, Shenai V.A., Vol. 6, Sevak Publication, Bombay, 1994.
4.	Technology of Printing, V. A. Shenai, Sevak Publications, Bombay, Vol. 4, 1990.
5.	Textile Printing by L. W. C. Miles, revised second edition published by SDC, 2003.
6.	Technology of Finishing, Shenai V.A., Vol. 10, Sevak Publication, Bombay, 1990.

**Course Outcomes (students will be able to...)**

CO1	<b>Explain</b> the need for sizing yarns and desizing of fabric, effect of scouring and bleaching agent on fabric pretreatment, mercerization of yarn and fabric. (K1)
CO2	<b>Applying</b> various dyes on textile coloration and understanding the importance of various textile processing parameters for quality dyeing. (K2)
CO3	<b>Comprehend</b> fundamental knowledge thickener selection for printing and stages of printing. (K2)
CO4	<b>Select</b> between different types of softeners, fastness-improving agents, antimicrobial, antistatic, flame retardant, their chemistry, application on fabric and evaluation tests. (K2)

**Mapping of Course Outcomes (COs) with Programme Outcomes (POs)**

		PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	<b>K1</b>	3	3	1	2	3
<b>CO2</b>	<b>K2</b>	3	3	1	2	3

<b>CO3</b>	<b>K2</b>	3	3	1	2	3
<b>CO4</b>	<b>K2</b>	3	3	1	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution  
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

<b>Course Code:</b> <b>TXP1022</b>	<b>Course Title: MDM-III</b> <b>Textile wet processing lab 1 (Pretreatment, Dyeing, Printing)</b>	<b>Credits = 4</b>		
		<b>L</b>	<b>T</b>	<b>P</b>
<b>Semester: V</b>	<b>Total contact hours: 60</b>	<b>0</b>	<b>0</b>	<b>8</b>
<b>List of Prerequisite Courses</b>				
TXT1107: Introduction to Textile Substrates, TXT1218: Introduction to Textile Wet Processing				
<b>List of courses where this course will be prerequisite</b>				
TXP1023: Textile Wet Processing Lab 2				
<b>Description of the relevance of this course in the MDM in Fibres and Textile Processing Technology</b>				



The practical will enable students to perform dyeing and printing on different textile substrates using various classes of dyes by different methods of application.

Sr.No.	Course Contents (Topics and subtopics)	Reqd. hrs
1.	Desizing cotton-acid desizing, enzyme desizing, oxidative desizing of cotton and Evaluation of desizing efficiency-staining with iodine, loss in weight and estimation of residual starch	4
2.	Scouring of cotton-open boil, pressure boil, pad-steam process and Evaluation of scouring efficiency-wetting time, sinking time, loss in weight	4
3.	Bleaching of Cotton by bleaching powder, hydrogen peroxide and Evaluation of bleaching efficiency -whiteness index and % reflectance	4
4.	To study dyeing of cotton and Viscose with Direct and Reactive dyes	4
5.	To study dyeing of cotton with Vat and Sulphur dyes	4
6.	To study dyeing of cotton with azoic colors	4
7.	To study dyeing of Wool and silk with Acid dyes	4
8.	To study dyeing of Polyester with Disperse dyes	4
9.	Direct style of printing of Direct and Reactive Dyes on cotton	4
10.	Direct style of printing of Vat Dyes and cotton	4
11.	Direct style printing on Wool and Silk with Acid dyes	4
12.	Direct style printing on Polyester and Nylon with Disperse dyes	4
13.	Discharge style of printing – white discharge under Reactive dyed ground	4
14.	Resist style of printing – White resist under reactive dyed ground	4
15.	Special print effect – Batik and Tie & Dye style of printing	4
<b>Total</b>		<b>60</b>

#### List of Textbooks/ Reference Books

1.	Gile's Laboratory Course in Dyeing, D G Duff, and R S Sinclair, SDC Publ.
2.	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol.3, 3rd edition, 2003.
3.	Technology of Dyeing, Shenai V.A., Vol. 6, Sevak Publication, Bombay, 1994.
4.	Technology of Printing, V. A. Shenai, Sevak Publications, Bombay, Vol. 4, 1990.

#### Course Outcomes (students will be able to.....)

CO1	<b>Perform</b> desizing, scouring and bleaching of cotton along with its evaluation. (K3)
CO2	<b>Demonstrate</b> colouration of natural and synthetic fibres using a different class of dyes. (K2)
CO3	<b>Achieve</b> different printing effects by varying fibres, application methods and machinery (K2).
CO4	<b>Evaluate</b> the performance effect of different classes of dyes on fibres (K3).

#### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

		PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	<b>K3</b>	3	3	1	2	3
<b>CO2</b>	<b>K2</b>	2	3	1	2	3

<b>CO3</b>	<b>K2</b>	2	3	1	3	3
<b>CO4</b>	<b>K3</b>	2	2	2	1	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution  
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

<b>Course Code:</b> <b>TXT1216</b>	<b>Course Title: MDM IV</b> <b>Chemistry &amp; Applications of Specialty Chemicals</b>	<b>Credits = 2</b>		
		<b>L</b>	<b>T</b>	<b>P</b>
<b>Semester: VI</b>	<b>Total contact hours: 30</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>List of Prerequisite Courses</b>				
TXT1107: Introduction to Textile Substrates, TXT1218: Introduction to Textile Wet Processing				
<b>List of courses where this course will be prerequisite</b>				

TXP1023: Textile Wet Processing Lab 2		
Description of the relevance of this course in the MDM in Fibres and Textile Processing Technology		
The course will provide student deep understanding about the role of different functional groups on the properties of various specialty chemicals used in different industries.		
Sr. No.	Course contents (topics/subtopics)	Reqd Hrs
1.	Nomenclature, functions, and classification of textile auxiliaries	2
2.	Surface activity phenomenon, Surfactants and their chemistry and applications.	2
3.	Anionic Surfactants: Properties and uses of anionics from carboxylic acids, alkylaryl sulphonates, alkyl sulphates, alkane sulphonates and phosphate esters, etc.	3
4.	Cationic Surfactants: Chemistry, Properties, and Applications	2
5.	Nonionic Surfactants: Chemistry, Properties, and Applications	2
6.	Processing Aids: The structure-property relationships of Antimigrant, Defoamers, Dyeing Assistants, Enzymes in Preparation, Lubricants, Peroxide Stabilizers, Printing Binders, Surfactants (Scouring and Wetting Agents), Thickeners Warp Sizes	5
7.	Performance Enhancers: The structure-property relationships of Antimicrobial Finishes, Antipilling Agents, Antistatic Agents, Durable Press Agents, Dye Fixatives, Elastomeric Finishes, Enzymes in Finishing, Flame Retardants, Hand Modifiers (Softeners and Hand Builders), Repellent Finishes, Soil Release Agents, Stain blockers and Ultraviolet Absorbers	5
8.	Qualitative and quantitative evaluation of auxiliaries; Testing of surfactants, detergency, identification of ionic nature.	3
9.	Biodegradability of surfactants	2
10.	Banned chemicals in pre-treatments, Natural textile auxiliaries	2
11.	Recent developments in textile auxiliaries	2
<b>Total</b>		<b>30</b>
List of Textbooks/ Reference Books		
1.	Textile Chemicals and Auxiliaries, Speel H.C., Reinhold Processing Corporation, New York, 1952	
2.	Textile Auxiliaries, Batty, J.W., Dergamon Press, Oxford, 1967.	
3.	Colourants and Auxiliaries: Organic Chemistry and Application Properties, Shore, J., SDC, Bradford, 1990.	
4.	Laundry Detergents, Smulders, E., Wiley VCH, Weinheim, 2002.	
5.	Chemistry and Textile Auxiliaries, Shenai V.A., Vol. 65, Sevak Publication, Bombay, 2nd edition, 2002.	
6.	Textile finishing, D. Heywood, ed., Society of Dyers and Colourists, Bradford, England, 2003	
7.	Chemical finishing of textiles, W.D. Schindler and P.J. Hauser, Woodhead Publishing, Cambridge, England, 2004	
Course Outcomes (students will be able to....)		
CO1	Evaluate surfactants and identify their ionic nature. (K3)	
CO2	Explain the biodegradability of surfactants and eco-friendly textile auxiliaries. (K2)	

CO3	<b>Understand</b> the fundamentals of textile auxiliaries. (K1)
CO4	<b>Classify</b> different types of surfactants and their role in textiles. (K2)

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs)</b>						
		<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	<b>K3</b>	2	3	1	2	3
<b>CO2</b>	<b>K2</b>	2	2	1	1	2
<b>CO3</b>	<b>K1</b>	2	2	1	2	2
<b>CO4</b>	<b>K4</b>	2	2	1	1	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution  
 K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

<b>Course Code:</b> <b>TXT1301</b>	<b>Course Title: MDM V</b> <b>Testing of Textile Materials</b>	<b>Credits = 2</b>		
		<b>L</b>	<b>T</b>	<b>P</b>
<b>Semester: VII</b>	<b>Total contact hours: 30</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>List of Prerequisite Courses</b>				
TXT1107: Introduction to Textile Wet Processing, TXT1218: Introduction to Textile Substrates				
<b>List of courses where this course will be prerequisite</b>				
TXP1023: Textile Wet Processing Lab 2				
<b>Description of the relevance of this course in the MDM in Fibres and Textile Processing Technology</b>				

This course will help students to understand and apply different analytical methods for testing textiles, measurement of colour fastness and assessment of performance properties of textile.		
<b>Sr. No.</b>	<b>Course contents (topics/subtopics)</b>	<b>Reqd. hrs</b>
1.	Objects of testing; Introduction to textile testing, Selection of samples for testing, Random and biased samples, Testing equipment and their use; Analysis of results, Quality, statistical analysis of results, t-test	4
2.	Analytical (Advanced) equipment's and their role in Textile analysis, Identification, and testing of fibres by different methods like density, burning behavior, stain test, melting point, dissolution test etc.	4
3.	Various testing standards such as BIS, AATCC, ISO along with their format for measurement and reporting of colour fastness to various agencies, standard depth of shade	8
4.	Tensile testing of fibres, yarns, and fabrics. Tearing, Bursting, Pilling and Abrasion resistance tests for fabrics. Bending, shear and compressional properties of fabrics. Fabric drape and handle. Crease and wrinkle behavior. Air, water, and water-vapour transmission through fabrics. Thermal resistance of fabrics. Testing of interlaced and textured yarns.	8
5.	Flame retardancy, antimicrobial, hydrophilic and hydrophobic testing of fabrics along with special tests for carpets.	4
6.	Care labelling, Testing of lycra blended fabric material	2
<b>Total</b>		<b>30</b>
<b>List of Textbooks/ Reference Books</b>		
1.	Textile Analysis, Trotman E.R., Trotman S.R., Charles Griffin and Co., London, 1932.	
2.	Principles of Textile Testing: An introduction to Physical methods and Testing textile fibres, yarn and fabric, Booth J.E., Heywood Books, London, 3rd edition, 1968.	
3.	Microscopic and Chemical Testing of Textiles, Koch, P.H., Chapman and Hall, London, 1963	
4.	Physical Properties of Textile Fibres, Morton, W.E. and Hearle, J.W.S., Textile Institute, Manchester, 2nd edition, 1975.	
5.	Society of Dyers and Colourists: standard methods for the determination of the colour fastness of Textiles and Leather.1980	
6.	Handbook of Textile Testing and Quality Control, Grover, B. and Hemby, P.S., Wiley Eastern Ltd., New Delhi, 2nd edition, 1988.	
7.	Textile Testing and Analysis, Collier, B.J. and Hellen H., Upper Saddle River: Pentice Hall Inc., 1999.	
8.	Principles of Textile Testing, 3e (PB) India: CBS Publishers and Distributors, 1996	
9.	Saville, B. P. Physical Testing of Textiles. United Kingdom: Elsevier Science, 1999	
10.	Raul, J. Textile Testing. India: APH Publishing Corporation, 2005	
11.	Izquierdo, V., Vermeersch, O., Dolez, P. I. Advanced Characterization and Testing of Textiles. United Kingdom: Elsevier Science, 2017	

<b>Course Outcomes</b> (students will be able to....)	
CO1	<b>Comprehend</b> the objects of testing and its reasons and stages at which testing is to be done. (K2)
CO2	<b>Analyze</b> different physical testing performed on the fibres, yarn, and fabric for their mechanical, aesthetic and performance behaviour. (K2)
CO3	<b>Interpret and examine</b> different fastness tests of the coloured goods. (K3)
CO4	<b>Identify</b> different testing standards and their importance. (K2)

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs)</b>						
		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	K2	1	2	2	1	3
CO2	K2	1	1	3	1	3
CO3	K3	3	3	1	1	3
CO4	K2	2	1	1	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution  
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

<b>Course Code:</b> <b>TXP1023</b>	<b>Course Title: MDM VI</b> <b>Textile wet processing lab 2 (Finishing and Testing)</b>	<b>Credits = 2</b>		
<b>Semester: VIII</b>	<b>Total contact hours: 60</b>	<b>L</b>	<b>T</b>	<b>P</b>
		<b>0</b>	<b>0</b>	<b>4</b>
<b>List of Prerequisite Courses</b>				
TXT1107: Introduction to Textile Substrates, TXT1218: Introduction to Textile Wet Processing				
<b>List of courses where this course will be prerequisite</b>				
None				
<b>Description of the relevance of this course in the MDM in Fibres and Textile Processing Technology</b>				
This will help students to understand the properties and applications of textile substrate used in different end-uses.				
<b>Sr. no.</b>	<b>Course Contents (Topics and subtopics)</b>			<b>Reqd. hours</b>
1.	Application of cross-linking agent on cotton fabric and testing of finished fabric for crease recovery angle, tensile and tear strength.			<b>8</b>

2.	Application of flame retarding agent on cotton fabric and testing of finished fabric by measurement of char length, rate of burning and Limiting Oxygen Index	<b>8</b>
3.	Application of softeners on cotton fabric and testing of finished fabric for its feel, drapability, effect on absorbency, yellowing, shade change, sewability testing, Handlometer /surface friction assessment.	<b>8</b>
4.	Application of water repellent/waterproof agent on cotton fabric and evaluation of fabric for water repellency by spray/shower test and water penetration test.	<b>8</b>
5.	Application of Optical brightening agent on cotton & Polyester fabric and evaluation of fabric for its whiteness.	<b>4</b>
6.	Application of stiffening agent and evaluation of fabric for its feel and bending length	<b>4</b>
7.	To measure the Tensile strength and % elongation of cotton & polyester yarn and fabric	<b>4</b>
8.	To measure the Tearing and bursting strength of cotton & polyester fabric	<b>4</b>
9.	To measure the % crimp of texturized yarn and fabric, ,	<b>4</b>
10.	To measure the GSM, drapability and bending length of finished fabrics	<b>4</b>
11.	To measure the count and denier of the yarn	<b>4</b>
<b>Total</b>		<b>60</b>

#### List of Textbooks/ Reference Books

1.	Textile Finishing, Hall A.J., Heywood book, London, 1966.
2.	An Introduction to Textile Finishing, Marsh J.T., B.I. Publication, Bombay, 1979.
3.	Technology of Finishing, Shenai V.A., Vol. 10, Sevak Publication, Bombay, 1990.
4.	Handbook of Fibre Finish Technology, Slade, P.E., Marcel, New York, 1998.
5.	Encyclopedia of Textile Finishing, Rouette, H.K., Springer Verlag, New York, 2001.

#### Course Outcomes (students will be able to.....)

CO1	<b>Apply</b> crosslinking, flame retarding agent, and softener on cotton fabric along with its evaluation. (K3)
CO2	<b>Apply</b> water & oil-repellent agents on the cotton fabric along with its evaluation. (K3)
CO3	<b>Apply</b> optical brightener on cotton & polyester fabric along with its evaluation. (K3)
CO4	<b>Measure</b> tensile, tearing, and bursting strength, & % elongation of cotton & polyester fabric and/ yarn. (K2)

#### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	K3	3	3	1	1	3
CO2	K3	3	3	1	1	3
CO3	K3	2	3	1	2	3
CO4	K2	2	3	1	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution  
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain