



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: UG

Branch: Textile Technology

Subject Code: BE04029051

Subject Name: Chemical Processing of Textile

w. e. f. Academic Year:	2024-25
Semester:	4
Category of the Course:	Basic Science Course

<b>Prerequisite:</b>	Basic understanding of chemistry and textile raw materials.
<b>Rationale:</b>	This course delves into the essentials of textile wet processing and textile coloration. It also covers the techniques of printing and finishing textile materials, enhancing both the aesthetic and functional properties of fabrics.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Grasp the fundamental principles and mechanisms involved in textile processing.	R,U
02	Identify and differentiate various chemicals used in preparatory and dyeing processes and apply them appropriately based on their end use.	U,A,E,N,C
03	Recognize different methods and styles of printing on both natural and synthetic fiber fabrics and blends.	U,A,E,C
04	Comprehend various dyeing, printing, and finishing processes.	U,A,E,C
05	Understand the characteristics of different finished fabrics and their specific applications.	U,A,E

*\*Revised Bloom's Taxonomy (RBT)*

## Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	Total no of hours per semester		Theory		Tutorial / Practical			
						ESE (E)	PA/ CA (M)	PA/ CA (I)	PBL (I)	ESE (V)	
45	0	30	15	90	3	70	30	20	30	50	200



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\* Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to Textile Processing: Overview of textile processing and its significance. Material flow for various processes and their objectives. Fabric inspection, and an introduction to chemicals and auxiliaries.	5	11
2.	Singeing, Shearing, and Cropping: Objectives and importance, types of singeing machines (plate, roller, and gas), and their parameters. Desizing: Objectives, classification, techniques (rot steeping, acid steeping, enzymatic desizing), desizing agents, and continuous desizing machines. Scouring: Objectives, chemicals used, continuous scouring with J-Box, and scouring recipes for cotton, wool, silk, and manmade fibers.	10	22
3.	Bleaching and Mercerization: Objectives and importance, oxidative and reductive bleaching agents, methods and machinery used, various ingredients, and the effect of process parameters (time, temperature, and pH). Use of optical whitening agents.	10	22
4.	Dyeing: Introduction to dyeing of yarns and fabrics, various classes of dyes (Direct, Basic, Acid, Vat, Reactive, and Disperse) and their applications. Different machines used for dyeing processes. Printing: Introduction to printing, different methods and styles of printing. Types of printing machines (block, flat screen, roller, rotary screen, and digital printing). Preparation of printing paste for different dyes, and the importance of after-treatment.	12	27
5.	Finishing: Introduction to finishing, classifications of various finishes (permanent and semi-permanent), silicon softening, milling, crease resistance, anti-shrink, water repellent, waterproof, flame proofing, setting of synthetic fiber fabrics, antistatic and soil release finishes. Equipment used: mangles, drying ranges, IR drying, stenter, calendars, raising, and milling machines.	8	18
	<b>Total</b>	<b>45</b>	<b>100</b>



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## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	20	15	10	20

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. Bleaching, Mercerising and Dyeing of Cotton Materials–R.S.Prayag
2. Textile Finishing –R.S.Prayag
3. Scoring and Bleaching – V.A. Shennai
4. Dyeing – V.A. Shennai
5. Textile Scouring & Bleaching - Trotman
6. Cellulosic Dyeing - John Shore
7. Technology of printing Vol. IV Shennai
8. Technology textile finishing Vol. X Shennai
9. Principles of Textile Finishing A K Roy Chaudhary
10. A Glimpse of the Chemical Technology of Textile Fibres R.R. Chakraverty

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

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

## Suggested Course Practical List:

1. Desizing of cotton fabric.
2. Scouring of cotton hank and fabric.
3. Bleaching of cotton with hypochlorite, and Hydrogen peroxide.
4. Mercerization of cotton fabric.
5. Dyeing of cotton by direct dye.
6. Dyeing of cotton by reactive dyes.
7. Dyeing of cotton by vat dyes.
8. Dyeing of polyester by Disperse dyes
9. Dyeing of wool
10. Determination of different fastness properties of dyed samples



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11. Printing with different dyestuff on cotton,
12. Printing with different dyestuff on silk and polyester
13. Develop water proof fabric.
14. Develop fire resistant fabric.
15. Develop crease resistant fabric.

### List of Laboratory/Learning Resources Required:

Spray Rating Tester, Laundrometer, High Temperature High Pressure Sample Dyeing, Laboratory Winch, Laboratory Jigger Machine, Pneumatic Padding Mangle Machine, Mini Stenter Dryer, Lab Coating Machine, Infra Colour Dyeing Machine Model, Sublimation Tester, Color Matching Cabinet, Fabric Stretch And Recovery Meter, Xenon/MBTL Light Fastness Tester, Shrinkage Measurement Template & Scale Universal, Perspiration Tester, Fabric Stretch and Recovery Meter (Extensio Meter), Laboratory Rotary cum Falt bed Printing Machine (Combined Mordern Printing), Water Heating Bath etc.

### Suggested Project List:

### Suggested Activities for Students:

1. Visit to Chemical processing unit and prepare report

- List of suggested activities for Problem Based Learning:

Sl. No.	Name of the activity	No. of hours	Evaluation Criteria
1	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data
2	Assignment writing. Numericals based assignment is preferable.	5 assignments of 2h each. Total = 10h	Based on the assignment submitted.
3	Self learning on-line course	Minimum duration of the course should be 10h.	Examination based assessment at the end of course. Based on the certificate produced.



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4	Poster/chart/power point preparation on technical topics	Duration = 6 h	Based on poster/chart preparation and presentation skills
5	Technical Video based learning related to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Report /presentation based on the video learning outcomes.
6	Working/non-working model on technical topics	Working = 12 h Non- working = 8 h	Based on inter department/external evaluation
7	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/any other issue	Duration = 15 h for industrial exposure Problem identification and tentative solution = 10 h Total = 20 h	Based on evaluation of critical problems and solutions
8	Group Discussion on emerging/trending technical topics based on subject	Duration = 1 h each	Based on performance in group discussion, technical depth, knowledge etc.
9	Real world case studies-based learning	Duration of data collection/study = 5h Report preparation = 5h Total = 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.

- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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