GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering
Level: Diploma
Branch: Textile Processing Technology
Subject Code : DI04028061
Subject Name : Chemistry of Textile Auxiliaries

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	Professional Elective - II

Prerequisite:	The objective of the "Chemistry of Textile Auxiliaries" course is to equip students with the knowledge and skills to select, apply, and evaluate chemical auxiliaries for efficient, safe, and sustainable textile wet processing.A foundational knowledge of general and organic chemistry—including chemical bonding, functional groups, acids, bases, and pH measurement—as well as familiarity with the properties of natural and synthetic textile fibers and basic textile wet processing steps (such as scouring, bleaching, dyeing, and finishing) is required for success in this course.
Rationale:	The primary objective of the "Chemistry of Textile Auxiliaries" course is to provide students with comprehensive knowledge about the types, chemical properties, functions, and practical applications of textile auxiliaries used throughout textile wet processing operations. The polytechnic graduates are required to supervise pretreatment operations of fibre, yarn & fabric and their dyeing, printing& finishing processes in industry.The course aims to enable students to select, use, and evaluate appropriate auxiliaries for scouring, bleaching, dyeing, printing, and finishing, ensuring optimal process efficiency and desired textile qualities. Additionally, it emphasizes understanding the environmental significance, safety, and emerging trends in sustainable and eco-friendly auxiliaries for modern textile industries.

Course Outcome:
After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the fundamental concepts and classification of textile auxiliaries.	U
02	Evaluate the selection criteria and applications of auxiliaries in various textile processes.	R & U
03	Understand the use and impact of various auxiliaries in pretreatment and dyeing.	U & A
04	Understand the use and impact of various auxiliaries in printing and finishing.	U& A
05	Demonstrate practical knowledge of auxiliary testing and analysis methods.	U, A&N

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

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to Textile Auxiliaries** 1.1 Definition and importance of textile auxiliaries in processing 1.2 Classification of textile auxiliaries 1.2.1 Based on processing stage 1.2.2 Examples and commercial names for each category 1.3 Selection criteria and advantages of textile auxiliaries 1.4 Functions and applications of speciality chemicals. 1.5 Green textile auxiliaries and speciality chemicals	7	15
2.	**Theory of detergency and surface activity** 2.1 Soaps and detergents 2.1.1 composition and functions 2.1.2 Mechanism of cleaning and impurity removal Mechanisms of wetting and penetration 2.1 Definition, principle and theory of surface activity 2.2 Concept of Angle of contact, Critical micelle concentration (CMC) and Hydrophilic-lipophilic balance (HLB) 2.3 Definition and general properties of surfactants. 2.2 Classification of surfactants 2.2.1 Chemical structure and Applications of surfactants 2.2.2 Cloud point of non-ionic surfactants 2.2.3 Biodegradability of surfactants	11	25
3.	**Functions, Properties and applications of Pretreatment auxiliaries** 3.1 Desizing 3.1.1 Wetting agents 3.1.2 Desizing Enzymes 3.2 Scouring 3.2.1 Rapid Wetting agents (Alkali Stable) 3.2.2 Defoaming/Antifoaming 3.2.3 Scouring enzymes	10	20

	3.3 Bleaching 3.3.1 Sequestering agents 3.3.2 Peroxide Stabilizer 3.3.3 Peroxide Killer 3.4 Mercerization 3.4.1 Mercerizing wetting agents **Functions, Properties and applications of Dyeing auxiliaries** 3.4.2 Levelling agent 3.4.3 Retarding agent 3.4.4 Dispersing agents 3.4.5 Dye Carrier sand Swelling agents 3.4.6 Dye Fixing agent 3.4.7 Washing off Agent 3.4.8 pH Control and Buffering Systems		
4.	4.1 **Auxiliaries in Printing** 4.1.1 Thickening agents 4.1.2 Hygroscopic agents 4.1.3 Mild oxidizing agents 4.1.4 Reducing agents 4.1.5 Defoamers 4.1.6 Binders and Fixers for pigment printing 4.1.7 After-washing agents 4.2 **Auxiliaries in Digital Printing** 4.2.1.1 Pre-treatment chemicals for inkjet printing 4.2.1.2 Inkjet Ink formulations and additives 4.2.1.3 Fixing agents for digital printing 4.2.1.4 Post-treatment chemicals 4.3 **Auxiliaries in Finishing** 4.3.1 Softening agents 4.3.2 Silicone emulsions 4.3.3 Cross linking agents 4.3.4 Urea formaldehyde derivatives 4.3.5 Melamine formaldehyde 4.3.6 Epoxides 4.3.7 PV alcohol 4.3.8 PVC acrylic polymer 4.3.9 Stiffening agents	10	20
5.	**Evaluation of Textile Auxiliaries:** 5.1 Need and significance of auxiliaries evaluation 5.1.1 Evaluation of wetting agents 5.1.2 Evaluation of Detergency 5.1.3 Evaluation of Wettability of textiles	7	15

	5.1.4 Evaluation of Antipilling agents 5.1.5 Evaluation of Levelling agents 5.1.6 Evaluation of Optical Brightening Agents		
	Total	**45**	**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**	**30**	**10**	**0**	**0**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

Books:

1. Chemistry of Textile Auxiliaries (Vol. V) by V AShenai
2. Textile Auxiliaries and Finishing Chemicals by A. A. Vaidya & S. S. Trivedi (ATIRA)
3. Evaluation of textile Chemicals (Vol. VIII) by V AShenai& R. H. Mehra
4. Surfactants in Textile Processing by A. Datyner

Open source software and website:

1. www.nptel.iitm.ac.in
2. https://ndl.iitkgp.ac.in
3. www.textileschool.com
4. www.textileguide.chemsec.com
5. www.textilelearner.net
6. www.textiletutorials.com
7. www.textilefashionstudy.com

Suggested Course Practical List:

1. To find out solid content of a given finishing auxiliaries.
2. To find out moisture content of a detergent.
3. To calculate HLB value and applications.
4. To find out ionic nature of a surfactant
5. To find out cloud point of a non-ionic detergent.
6. To evaluate efficiency of a given sample of wetting agent and detergent.
7. To evaluate efficiency of a desizing agents.
8. To evaluate efficiency of a levelling agents.
9. To evaluate efficiency of carriers for dyeing of polyester with disperse dye.
10. To find out ionic nature of a given softeners.
11. To evaluate efficiency/handle of a given softeners.
12. Evaluation of printing gums for:
    1. Colour aspects, 2. Moisture content, 3. pH

4. Free alkali, 4. Ash content, 5. Viscosity

List of Laboratory/Learning Resources Required:

1. Electric Oven
2. Water Heating Bath
3. Electronic Weighing Balance
4. Suitable Glassware
5. Surface tension measurement apparatus
6. Contact angle goniometer

Suggested Project List:

1. Presentation on classification of textile auxiliaries by processing stage with real commercial examples.
2. Comparative study of anionic, cationic, nonionic, and amphoteric surfactants used in dyeing/wetting.
3. Evaluation of desizing efficiency using wetting agents and enzymes in fabric preparation.
4. Evaluation of different types of softeners (anionic, cationic, silicone) on fabric hand feel.
5. Testing and comparison of different defoaming and sequestering agents.
6. Organize visits to textile processing units to observe the application of auxiliaries on an industrial scale.

Suggested Activities for Students: If any

1. Experimental evaluation of surface activity and hydrophilic-lipophilic balance (HLB) for different surfactants used in textiles.
2. Study on measurement of contact angle and critical micelle concentration (CMC) for selected wetting agents.
3. Investigation of biodegradability and environmental impact of common textile surfactants.
4. Formulation and testing of soaps and detergents for cleaning efficiency on fabric samples.
5. Investigation on eco-friendly auxiliaries and sustainable finishing chemicals.
6. Nanotechnology in textile auxiliaries: efficacy and applications.
7. Use spectrophotometric methods to evaluate optical brightening agent effectiveness.

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