GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester - IV

Course Title: Chemistry of Textile Auxiliaries
(Course Code: 4342801)

Diploma programmes in which this course is offered	Semester in which offered
Textile Processing Technology	4th Semester

1. RATIONALE

The polytechnic graduates are required to use textile auxiliaries in industry for pretreatment, dying, printing and finishing operations. The quality of processing and textile auxiliaries are very important to give desired finish. The basic knowledge of various textile auxiliaries and skills to utilize these auxiliaries for various wet processing is of paramount importance for textile processors. This course on Chemistry of Textile Auxiliaries has been designed to provide basic knowledge and skills for application methods of Textile Auxiliaries.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency,

- **Use relevant auxiliaries for various textile chemical processing in wet processing industries.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

a) Select textile auxiliaries for textile wet processes.
b) Relate surface activity for various application in wet processes.
c) Select appropriate auxiliaries for pretreatment and finishing of textiles.
d) Choose appropriate auxiliaries for dyeing and printing of textiles.
e) Relate green surfactants for textile wet processing applications.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
3	0	0	3	30*	70	0	0	100

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of Cos and the remaining 20 marks is the average of 2 tests to be

taken during the semester for the assessing the attainment of the cognitive domain Uos required for the attainment of the Cos.

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** – Practical; **C** – Credit, **CA** – Continuous Assessment; **ESE** – End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the Cos. *Some of the **PrOs** marked **'*'** (in 2pprox.. Hrs column) are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'*.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	--- Not Applicable ---		
	Total Hours		---

Note

i. *More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the Cos. The above table is only a suggestive list.*

ii. *The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the Cos and ultimately the competency.*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	--- Not Applicable ---	

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	--- Not Applicable ---	

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned Cos and PrOs. More could be added to fulfil the development of this competency.

a) Work as a leader/a team member.
b) Practice good housekeeping
c) Follow ethical practices.

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.

iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level Uos of *Revised Bloom's taxonomy* that are formulated for development of the Cos and competency. If required, more such higher level Uos could be included by the course teacher to focus on attainment of Cos and competency.

Unit	Unit Outcomes (Uos) (4 to 6 Uos at different levels)	Topics and Sub-topics
Unit – I **Textile Auxiliaries**	1a. lassify textile auxiliaries 1b. elect textile auxiliaries for the given wet process.	1.1 General Consideration and classification of textile auxiliaries 1.2 Selection of textile auxiliaries 1.3 Advantages of textile auxiliaries
Unit – II **Surface Activity**	2a. escribe surface activity theory and surface active agents. 2b. xplain application of various surfactants. 2c. escribe biodegradability of surfactants.	2.1 Definition and classification of surface active agents 2.2 Principles and theory of surface activity 2.3 Essential requirement of surface active agents 2.4 Different types surfactants and application 2.4.1 Anionic surfactants 2.4.2 Cationic surfactants 2.4.3 Non-ionic surfactants 2.4.4 Amphoteric surfactants
Unit– III **Pretreatment and Finishing Auxiliaries**	3a. Describe function of various pretreatment and dyeing auxiliaries. 3b. Explain properties of different pretreatment and dyeing auxiliaries 3c. Choose appropriate auxiliary for pretreatment and dyeing of given fabric. 3d. Describe function of various finishing auxiliaries. 3e. Explain properties of different finishing auxiliaries 3f. Choose appropriate auxiliary for finishing of given fabric.	3.1 Functions, properties and application of 3.1.1 Scouring auxiliaries 3.1.2 Mercerizing auxiliaries 3.1.3 Various bleaching agents 3.1.4 Wetting agents 3.2 Functions, properties and application of 3.2.1 Cross linking agents 3.2.2 Urea formaldehyde derivatives 3.2.3 Melamine formaldehyde 3.2.4 Triazones 3.2.5 Epoxides 3.2.6 PV alcohol 3.2.7 PVC acrylic polymer 3.2.8 Silicon emulsion

Unit– IV **Dyeing & Printing Auxiliaries**	4a.Explain properties of different dyeing auxiliaries 4b. Choose appropriate auxiliary for dyeing of given fabric. 4c. Describe function of various printing auxiliaries. 4d.Explain properties of different printing auxiliaries 4e. Choose appropriate auxiliary for printing of given fabric.	4.1 Functions, properties and application of 4.1.1 Dispersing agents 4.1.2 Leveling agents 4.1.3 Carriers 4.1.4 Sequestering agents 4.1.5 Stripping agents 4.1.6 Dye fixing agents 4.2 Functions, properties and application of 4.2.1 Emulsion thickeners 4.2.2 Hygroscopic agents 4.2.3 Antifoaming agent 4.2.4 Reducing agents 4.2.5 Oxidizing agents
Unit-V **Green Surfactants**	5a. Explain concept and principles of green technology 5b. Describe biodegradability of surfactant 5c. Choose formaldehyde free finishing agents 5d. Explain green surfactants	5.1 Green Technology – concept, Principles 5.2 Biodegradability of Surfactant 5.3 Formaldehyde free finishing agents 5.4 Eco-friendly Surfactants and its advantages

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Textile Auxiliaries	06	2	4	2	08
II	Surface Activity	10	4	6	4	14
III	Pretreatment and Finishing Auxiliaries	10	4	8	8	20
IV	Printing & Dyeing Auxiliaries	10	4	8	8	20
V	Green Surfactants	06	2	4	2	08
Total		**42**	**16**	**30**	**24**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

Note*: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test*

items/questions assess the attainment of the Uos. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Survey market for various dyes, pigments, auxiliaries and chemicals. Compare them based in print effects, fastness properties, and ecological aspects and costing.
b) Collect information about novel printing techniques.
c) Prepare a list of auxiliaries utilized in pretreatment with their commercial trade name from various auxiliaries' manufacturers with the help of market survey.
d) Prepare a list of auxiliaries utilized in dyeing with their commercial trade name from various auxiliaries' manufacturers with the help of market survey.
e) Prepare a list of auxiliaries utilized in printing with their commercial trade name from various auxiliaries' manufacturers with the help of market survey.
f) Prepare a list of auxiliaries utilized in finishing with their commercial trade name from various auxiliaries' manufacturers with the help of market survey.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4*** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide students on how to address issues on environment and sustainability.
g) Guide students for using data manuals.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more Cos which are in fact, an integration of PrOs, Uos and ADOs. Each student will have to maintain

dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the micro-project should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented Cos.

A suggestive list of micro-projects is given here. This has to match the competency and the Cos. Similar micro-projects could be added by the concerned course teacher:

a) **Auxiliaries:** Prepare a data sheet for various auxiliaries and its application in textile wet processing.
b) **Biodegradability**: Make a note for concept of biodegradability and its importance with examples of biodegradable surfactants.
c) **Surfactants**: Prepare a data sheet for various surfactants with their structure and applications.
d) **Pretreatment:** Collect the data for various auxiliaries utilized in pretreatment processes applying industrial survey and internet search.
e) **Dyeing:** Collect the data for various auxiliaries consumed in dyeing processes applying industrial survey and internet search.
f) **Printing:** Collect the data for various auxiliaries relate printing processes applying industrial survey and internet search.
g) **Finishing:** Collect the data for various auxiliaries claim in finishing processes applying industrial survey and internet search.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Chemistry of Textile Auxiliaries (Vol. – V)	Dr. V A Shenai	Sevak Publication, Mumbai Latest Publications
2	Textile Auxiliaries & Finishing Chemicals	A A Vaidya & S S Trivedi	ATIRA, Ahmedabad Latest Publications
3	Evaluation of Textile Chemicals (Vol. – VIII)	Dr. V A Shenai & R H Mehra	Sevak Publication, Mumbai Latest Publications
4	Anthology of Speciality Chemicals for Textiles	C N Sivaramakrishnan	Colour Publications Pvt. Ltd., Mumbai, Latest Publications

14. SOFTWARE/LEARNING WEBSITES

a) www.nptel.iitm.ac.in
b) https://ndl.iitkgp.ac.in
c) www.textileschool.com
d) www.textileguide.chemsec.com
e) www.textileassociationindia.org
f) https://textilechemrose.blogspot.com
g) www.textilelearner.blogspot.com
h) www.textileapex.blogspot.com
i) www.texauxchemicals.com
j) http://books.google.co.in

k) http://www.niir.org/books

15. PO-COMPETENCY-CO MAPPING

Semester III	Chemistry of Textile Auxiliaries – 4332805						
	Pos						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ development of solutions	PO 4 Engineering Tools, Experimentation &Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
Competency	Use relevant auxiliaries for various textile chemical processing in wet processing industries						
Course Outcomes CO a) Select textile auxiliaries for textile wet processes	3	-	-	-	-	-	3
CO b) Relate surface activity for various application in wet processes	3	2	-	-	3	-	3
CO c) Select appropriate auxiliaries for pretreatment and finishing of textiles	3	2	2	-	3	2	3
CO d) Choose appropriate auxiliaries for dyeing and printing of textiles	3	2	2	-	3	2	3
CO e) Relate green surfactants for textile wet processing applications .	3	-	2	-	3	-	3

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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