GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI02C28021(Only for C to D Students)

Course / Subject Name : Principles of Textile Chemical Processing

w. e. f. Academic Year:	2024 – 25
Semester:	2nd
Category of the Course:	PCC

Prerequisite:	A foundational understanding of principles of textile chemical processing requires prior knowledge in basic chemistry, physics and mathematics. Students should be familiar with various principles of chemistry & physics including the heat transfer, molecular structure, liquid flow, bonding, etc. Additionally, fundamental concepts of mathematics will aid in the preparation of solutions for various textile processes. Familiarity with basic chemical & physical principles, terminologies and processes will also be required, enabling students to contextualize their learning within the broader textile wet processing industry.
Rationale:	Processing of the textiles is one of the important processes in chemical application technology. This gives the textile required pretreatment, finish, colour and print. The processing is a vast complex area in itself and hence there is a separate branch of engineering known as textile processing. This course provides only basic knowledge about textile wet processing including the chemical technology involved in the wet processing of textiles. This course is therefore a key course for textile processors.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Apply concepts of fibre structure and mathematical aspects for chemical processing.	R + A
02	Choose chemicals based on need of pretreatment of textiles.	U + A
03	Prepare a bath for coloration of textiles.	R + U + A
04	Suggest chemicals for finishing of textiles.	R + U + A
05	Relate green solvents and eco-friendly substitutes in textile chemical processing.	R + U + A

**Revised Bloom's Taxonomy (RBT)*

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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 / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Fundamentals of chemical processing** 1.1 Difference between fibre, yarn and fabric 1.2 Amorphous and crystalline regions of textile fibres and their impact on chemical processing of textiles. 1.3 Mathematical aspects for textile chemical processing.	08	15
2.	**Pretreatments of textiles** 2.1. Need of pretreatments of textiles 2.2. Principles involve in pretreatments of textiles 2.2.1. Emulsification 2.2.2. Saponification 2.2.3. Suspension 2.2.4. Dispersion 2.3. Various chemicals used in different pretreatments with their basic structure, chemical formulas, properties, etc.	08	20
3.	**Colouration of textiles** 3.1 Need of colouration of textiles. 3.2 Difference between colours, dyes and pigments. 3.3 Important properties of dyes. 3.4 Principles involve in colouration of textiles 3.4.1. Adsorption or Exhaustion 3.4.2. Absorption or Diffusion 3.4.3. Fixation or Reaction	12	30

	3.4.4. Equilibrium 3.5 Preparation of dye solution, paste for printing 3.6 Various chemicals used in different colouration process with their basic structure, chemical formulas, properties, etc.		
4.	**Finishing of textiles** 4.1 Need of finishing 4.2 Principles involve in finishing of textiles 4.2.1. Conduction 4.2.2. Evaporation 4.2.3. Convection 4.2.4. Structure stability 4.3 Various chemicals used in different finishing with their basic structure, chemical formulas, properties, etc.	09	20
5.	**Green concept of Textile Chemical Processing** 5.1 Impacts of textile chemical processing on Environment. 5.2 Harmful textile chemicals and their eco-friendly substitutes. 5.3 Scope of biotechnology in textile chemical processing	08	15
	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**
35	**35**	**30**	**0**	**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:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Fundamental Principles of Textile processing	Dr. V. A. Shenai	Sevak Pulications, Mumbai – 400031
2	Basics of Textile Chemical Processing	D Gopalkrishnan	Daya Publishing House ISBN: 978-9351308782
3	Green Chemistry	Stanley E.	ChemChar Research, INC Publishers

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
		Manahan	IBSN: 0-9749522-4-93

(b) Open source software and website:

1. https://nptel.ac.in
2. www.youtube.com
3. https://ndl.iitkgp.ac.in
4. www.textilelearner.net
5. www.textiletutorials.com
6. www.textilefashionstudy.com

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Calculate requirement of dye and chemicals for various chemical processing of textiles.	I	02
2	Prepare solution for pretreatment of textiles.	II	02
3	Prepare solution and paste for colouration of textiles.	III	04
4	Prepare solution for finishing of textiles.	IV	04
5	Perform market and internet survey for collecting the data related to harmful chemicals and their eco-friendly substitutes.	V	04
	Total Hours		16

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Electronic weighing balance	2,3,4
2	Glass-wares: Beaker, Pipette, Glass-rods	2,3,4
3	Water-bath	2,3,4

Suggested Project List:

1) **Data sheet:** Prepare a data sheet for various combinations of chemicals and their quantities required for various chemical processing of textiles.

2) **Pretreatment:** Collect the data for various pretreatments processes applying industrial survey and internet search.
3) **Dyeing:** Collect the data for various dyeing processes applying industrial survey and internet search.
4) **Printing:** Collect the data for various printing processes applying industrial survey and internet search.
5) **Finishing:** Collect the data for various finishing processes applying industrial survey and internet search.
6) **Green chemicals:** Prepare a report on chemicals currently consumed in textile chemical processing industries and suggest eco-friendly substitute for them.
7) **Biotechnology:** Compile a report related to scope of biotechnology in textile chemical processing.
8) **Pollution:** Prepare a data-sheet on impact of textile chemical processing on environment with standard toxic limits.

Suggested Activities for Students:

1. Prepare a chart by collecting various samples of fibre, yarn and fabric
2. Prepare list of chemicals required for pretreatment of textiles with their structure, molecular formula, and properties.
3. Prepare list of chemicals required for dyeing of textiles with their structure, molecular formula, and properties.
4. Prepare list of chemicals required for printing of textiles with their structure, molecular formula, and properties.
5. Prepare list of chemicals required for finishing of textiles with their structure, molecular formula, and properties.
6. Give seminar on scope of biotechnology on chemical processing of textiles.

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