



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI03028041

Course / Subject Name : Dyeing Technology - I

w. e. f. Academic Year:	2024-25
Semester:	3 <sup>rd</sup>
Category of the Course:	PCC

<b>Prerequisite:</b>	A foundational understanding of dyeing technology – I requires prior knowledge in basic dye chemistry and application. Students should be familiar with various applications and chemistry of dyes for natural textile fabrics. Additionally, fundamental concepts of chemistry will aid in the preparation of dye solution for various textile dyeing processes. Familiarity with basic chemical & their functions, terminologies and processes will also be required, enabling students to contextualize their learning within the broader textile wet processing industry.
<b>Rationale:</b>	The polytechnic graduates are required to supervise operations of fibre, yarn and fabric for their dyeing & printing processes in industry. They should have basic knowledge and skills to handle dyeing and printing processes. The course on Dyeing Technology - I have been designed to provide basic knowledge and skills as well as recent technological developments in the area of dyeing. This course also provides concepts of various dyes , dyeing terms and auxiliaries used for dyeing as well as methods <b>and machines</b> of textile dyeing technology.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Select relevant dyes, auxiliaries and understand different terms for dyeing.	R + A
02	Use relevant water soluble dyes for dyeing the given job.	R + U + A
03	Use relevant water insoluble dyes for dyeing the given job.	R + U + A
04	Use relevant dyeing machine as per production capacity.	R + U + A
05	Select relevant dyes and auxiliaries for wool and silk.	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
L	T	PR	C	Theory		Tutorial / Practical		
				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.	Textile Dyeing 1.1 Definition of dyeing and different dyeing Terminology [Dye, Dyeing, Pigment, Percent Shade, Self-Shade, Compound Shade, Material to liquor ratio (M:L R), Percent exhaustion, Affinity, Substantivity, Standing bath, Topping, Stripping, different fastness properties ] 1.1 Classification of Dyes 1.2.1 Classification of Dyes according to their Application method 1.3 Mechanism of Dyeing:- Adsorption, Diffusion, Fixation	07	15
2.	2.1. Cellulosic dyeing with Water Soluble dyes : Direct dye and Reactive dye: 2.1.1 Properties 2.1.2 Types 2.1.3 Parameters affecting dyeing 2.1.4 Reactive systems in reactive dye 2.1.5 Classification of reactive dyes 2.2. Application methods: 2.2.1 Batch wise dyeing 2.2.2 Semi continuous dyeing 2.2.3 Continuous dyeing 2.3. After treatments: 2.3.1 Washing 2.3.2 Soaping 2.3.3 Stripping 2.3.4 To improve washing fastness of direct dyed cotton	11	25



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3.	3.1 Cellulosic dyeing with Water insoluble dyes : Vat dye, Solublised Vat dye, Azoic colour, Sulpur dye 3.1.1 Properties 3.1.2 Types 3.1.3 Classification 3.1.4 Parameters affecting dyeing 3.1.5 Application methods 3.2 Problems and remedies in dyeing	11	25
4.	Textile Dyeing machines for cellulosic material 4.1.Principle, construction and Working of : 4.1.1 Jigger Dyeing Machine 4.1.2 Winch Dyeing Machine 4.1.3 Package Dyeing Machine 4.1.4 Padding Mangle 4.2 Merits and Demerits of above dyeing machineries.	08	20
5.	Dyeing of Wool and Silk 5.1 Dyeing with acid dye: 5.1.1 Factors affecting dyeing 5.1.2 Principles 5.1.3 Exhaust dyeing method 5.2 Dyeing with basic dye: 5.2.1 Factors affecting dyeing 5.2.2 Principles 5.2.3 Exhaust dyeing method 5.3 Faults obtained in dyeing and their remedies	08	15
<b>Total</b>		<b>45</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
30	35	35	0	0	0

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



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## References/Suggested Learning Resources:

### (a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Technology of Dyeing	Dr V.A. Shehnai	Sevak Publications, Mumbai 1990
2	Cotton Piece Dyeing	S. V. Gokhale	Ahmedabad Textile Industry's Research Association
3	Handbook of Textile Processing Machinery	R. S. Bhagwat	Colour Publication PVT. LTD., Mumbai
4	Technology of Dyeing	R. S. Prayag	Shree J. Printers, Pune
5	Chemical Technology in the Colouration of Textiles VOL – 1	S. R. Karmakar	Colour Publication PVT. LTD., Mumbai

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

1. [www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in)
2. <https://ndl.iitkgp.ac.in>
3. [www.textileschool.com](http://www.textileschool.com)
4. [www.textileguide.chemsec.com](http://www.textileguide.chemsec.com)
5. [www.textileassociationindia.org](http://www.textileassociationindia.org)
6. [www.textilelearner.blogspot.com](http://www.textilelearner.blogspot.com)
7. [www.textileapex.blogspot.com](http://www.textileapex.blogspot.com)
8. [www.zimmer-usa.com](http://www.zimmer-usa.com)
9. [www.zepint.com](http://www.zepint.com)

## Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Dye cellulosic yarn / fabric with Direct dyes	II	02
2	Give After treatment to direct dyed material	II	02
3	Dye cellulosic with hot brand Reactive dyes by exhaust methods	II	02
4	Dye cellulosic with cold brand Reactive dyes by exhaust methods	II	02
5	Dye cellulosic with vinyl-sulphone Reactive dyes by exhaust methods	II	02



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6	Dye cellulosic with Reactive dyes by CPB method	II	04
7	Dye cellulosic with Reactive dyes by PDC method	II	02
8	Dye cellulosic with Reactive dyes by PDS method	II	02
9	Dye cellulosic with vat dye by I <sub>N</sub> method	III	02
10	Dye cellulosic with vat dye I <sub>w</sub> method	III	02
11	Dye cellulosic with vat dye I <sub>K</sub> method	III	02
12	Dye cellulosic with Solublised vat dye	III	02
13	Dye cellulosic with sulphur dye	III	02
14	Dye cellulosic azoic colour	III	02
15	Dye wool with acid and/or basic dye	V	02
16	Dye silk with acid and/or basic dye	V	02
Total Hours			32

## List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Dye Pots: 250 ml, 500 ml	All
2	Glass rod	All
3	Beaker: 100 ml, 250 ml, 500 ml	All
4	Measuring Cylinder of capacity 10 ml, 25 ml, 100 ml	All
5	Water Heating Bath	All
9	Laboratory Stirrer: 300 to 500 rpm	All
10	Laboratory Oven: 150°C	7-8
12	Laboratory Padding Mangle: Horizontal	All
13	Digital weighing balance: 0.02 gm accuracy (100 gm)	All

## Suggested Project List:

- 1) **Dyed sample collection:** Visit textile dyeing industries/market shops and collect at least 20 to 30 various dyed samples of cotton/silk/wool fabrics. Classify them with respect to shade.
- 2) **Cost of dyeing:** Calculate the cost of dyeing with respect to price of dye and chemicals of any two dyeing methods for cotton.
- 3) **Shade matching:** Collect dyed samples from dye house. Using any class of dye match the shade in laboratory. Present the same with recipe.
- 4) **Dyeing parameters:** Choose any one dyeing process, and change any one dyeing parameter for dyeing process. Prepare a sample report with observations.



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- 5) **Dyeing faults:** Visit industries and collect sample of faulty dyeing and find remedies to rectify the same. Present report.
- 6) **Sample book:** Prepare a sample book of dyes samples of cotton, silk and wool with various dyes.

### Suggested Activities for Students:

- 1) Survey market for various dyes, pigments, auxiliaries and chemicals. Compare them based in dyeing effects, fastness properties, and ecological aspects and costing.
- 2) Collect information about novel dyeing techniques.
- 3) Prepare table for various ingredients used in dyeing of cellulosic with their role in dyeing process.
- 4) Prepare table for various ingredients used in dyeing of wool with their role in dyeing process.
- 5) Prepare table for various ingredients used in dyeing of silk with their role in dyeing process.

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