



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI03028051

Course / Subject Name : Printing Technology – I

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

<b>Prerequisite:</b>	A foundational understanding of printing technology – I requires prior knowledge in basic dye chemistry and application. Students should be familiar with various applications chemistry of dyes for natural textile fabrics. Additionally, fundamental concepts of chemistry will aid in the preparation of paste for various textile printing 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 Printing Technology - I have been designed to provide basic knowledge and skills as well as recent technological developments in the area of dyeing & printing. This course also provides concepts of various thickeners and auxiliaries used for printing as well as methods and styles of textile printing technology.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Select relevant ingredients and thickener for printing the given fabric	R + A
02	Use relevant printing method and style for the given job.	U + A
03	Use relevant printing machine based on the design and production capacity.	R + U + A
04	Develop print on cotton using specified dyes.	R + U + A
05	Produce print on silk and wool using specified dyes.	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.	<p><b><u>Textile Printing</u></b></p> <p>1.1 Dyeing and Printing: Purpose and differentiation</p> <p>1.2 Printing stages:</p> <p style="margin-left: 20px;">1.2.1 Fabric preparation</p> <p style="margin-left: 20px;">1.2.2 Print paste preparation</p> <p style="margin-left: 20px;">1.2.3 Printing, drying, fixation of prints</p> <p style="margin-left: 20px;">1.2.4 After treatments.</p> <p>1.3 Print paste: Ingredients and their functions</p> <p>1.4 Thickeners:</p> <p style="margin-left: 20px;">1.4.1 Classification</p> <p style="margin-left: 20px;">1.4.2 Advantages and limitations</p> <p style="margin-left: 20px;">1.4.3 Selection criteria</p>	06	15
2.	<p><b><u>Methods and Styles of Printing</u></b></p> <p>2.1. Methods of printing:</p> <p style="margin-left: 20px;">2.1.1 Classification</p> <p style="margin-left: 20px;">2.1.2 Tie and dye</p> <p style="margin-left: 20px;">2.1.3 Batik printing</p> <p style="margin-left: 20px;">2.1.4 Stencil printing</p> <p style="margin-left: 20px;">2.1.5 Block printing</p> <p style="margin-left: 20px;">2.1.6 Roller printing</p> <p style="margin-left: 20px;">2.1.7 Screen printing</p> <p style="margin-left: 20px;">2.1.8 Advantages and limitations of above methods.</p> <p>2.2. Styles of Printing:</p> <p style="margin-left: 20px;">2.2.1 Classification</p> <p style="margin-left: 20px;">2.2.2 Principles of Direct styles</p> <p style="margin-left: 20px;">2.2.3 Principles of Discharge styles</p>	06	15



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	<p>2.2.4 Principles of Resist styles</p> <p>2.2.5 Dye selection criteria for discharge printing.</p>		
3.	<p><b><u>Printing Machineries</u></b></p> <p>3.1 Table Printing:</p> <p>3.1.1 Technical feature</p> <p>3.1.2 Faults, causes and remedies.</p> <p>3.2 Screen preparation:</p> <p>3.2.1 Flat screen, rotary screen, procedure, material required.</p> <p>3.3 Flat-bed screen printing:</p> <p>3.3.1 Technical features</p> <p>3.3.2 Types and sizes of squeezes</p> <p>3.3.3 Advantages and limitations.</p> <p>3.4 Rotary screen printing:</p> <p>3.4.1 Technical features</p> <p>3.4.2 Types and sizes of squeezes</p> <p>3.4.3 Advantages and limitations.</p>	11	25
4.	<p><b><u>Printing of Cotton</u></b></p> <p>4.1 Print fixation:</p> <p>4.1.1 Methods – steaming, curing, polymerizing</p> <p>4.2 Fixation machineries: working and application of</p> <p>4.2.1 Star ager</p> <p>4.2.2 Rapid ager</p> <p>4.2.3 Loop ager</p> <p>4.3 Printing with direct dye:</p> <p>4.3.1 Print paste formulation for direct style and discharge style of printing</p> <p>4.3.2 Process sequence</p> <p>4.4 Printing with reactive dye:</p> <p>4.4.1 Print paste formulation for direct style, discharge and resist style of printing</p> <p>4.4.2 Process sequence</p> <p>4.5 Printing with vat and solublised vat dye:</p> <p>4.5.1 Print paste formulation for direct style of printing</p> <p>4.5.2 Process sequence</p> <p>4.6 Printing with azoic dye:</p> <p>4.6.1 Print paste formulation for direct style of printing</p> <p>4.6.2 Process sequence</p> <p>4.7 Pigment printing:</p> <p>4.7.1 Principle, mechanism, print paste formulation</p> <p>4.7.2 Process sequence of printing</p>	12	30



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	4.7.3 Advantages and disadvantages. 4.8 Special print effect: 4.8.1 Khadi printing 4.8.2 Crimp styles		
5.	<b>Printing of Wool and Silk</b> 5.1 Fabric preparation: 5.1.1 Process sequence for wool and silk 5.2 Printing with acid dye: 5.2.1 Print paste formulation for direct style of printing 5.2.2 Process sequence 5.3 Printing with basic dye: 5.3.1 Print paste formulation for direct style of printing 5.3.2 Process sequence 5.4 Printing with metal complex dye: 5.4.1 Print paste formulation for direct style of printing 5.4.2 Process sequence	10	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)

## References/Suggested Learning Resources:

### (a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Technology of Printing Vol – IV	Dr V.A. Shehnai	Sevak Publications, Mumbai 1990
2	Textile Printing	L.W.C. Miles	Society of Dyers and Colourists, 1981, ISBN: 9780901956330
3	Introduction to Textile Printing	W. Clarke	Wood-head Publishing Ltd., Cambridge, ISBN: 9781855739949
4	Technology of Printing	R. S. Prayag	Shree J. Printers, Pune



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Sr. No.	Title of Book	Author	Publication with place, year and ISBN
5	Principles of Cotton Printing	D. G. Kale	Mahajan Brothers
6	Silk Dyeing, Printing and Finishing	George Henry Hurst	Bell, London Rarebooks Club.com (e-copy) 2012, ISBN: 9781130986525

## (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. <https://textilechemrose.blogspot.com>
7. [www.textilelearner.blogspot.com](http://www.textilelearner.blogspot.com)
8. [www.textileapex.blogspot.com](http://www.textileapex.blogspot.com)
9. [www.zimmer-usa.com](http://www.zimmer-usa.com)
10. [www.zeprint.com](http://www.zeprint.com)

## Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Prepare a Thickening Paste for printing	I	02
2	Develop tie and dye effect on the given fabric.	II	02
3	Develop batik effect on the given fabric.	II	02
4	Expose the screen with relevant design for screen printing.	III	02
5	Printing of Cotton with Direct dye with direct and discharge style.	IV	02
6	Printing of Cotton with Reactive dye with direct, discharge and resist style. (steaming, curing, alkali padding)	IV	04
7	Printing of Cotton with Vat dye with direct style.	IV	02
8	Printing of Cotton with Solublised dye with direct style.	IV	02
9	Printing of Cotton with Azoic dye with direct style.	IV	02
10	Printing of Cotton with pigments.	IV	02
11	Printing of Acid dyes on Wool/Silk fabric	V	02



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12	Printing of Basic dyes on Wool/Silk fabric	V	02
13	Printing of Metal complex dyes on Wool/Silk fabric	V	02
Total Hours			28

## 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	Wooden Screen	5-12
6	Electric Iron: 230V, 1000W	2-12
7	Rubber Squeegee	5-12
8	Laboratory Printing Table	5-12
9	Laboratory Stirrer: 300 to 500 rpm	1, 5-12
10	Laboratory Pressure Steamer: 30 psi and 150°C	5-12
11	Laboratory Drying, Curing and Setting Chamber: Temperature upto 220°C, working width - 450mm, length 1.7 meter, heater capacity - 8/16/24 kilo-watt	2,3,5-12
12	Laboratory Padding Mangle: Horizontal	5,6
13	Digital weighing balance: 0.02 gm accuracy (100 gm)	All

## Suggested Project List:

- 1) **Print sample collection:** Visit textile printing industries/market shops and collect at least 20 to 30 various printed samples of cotton/silk/wool fabrics. Classify them with respect to style and method of printing.
- 2) **Screen making:** Prepare a short video film of flat-bed screen and rotary screen making by visiting industries, and also collect the sample of screen having various mesh size.
- 3) **Performance of thickeners:** collect different thickeners used in textile printing industries, and analyze their performance with respect to viscosity, stability under various pH, and colour yield.
- 4) **Printed design:** Visit industries and market shops, collect at least 20 samples of different varieties, and analyze the design with respect to pattern, number of colours, percent coverage, overlapping, and blotches.
- 5) **Printing machine:** Prepare a short video film of flat-bed screen and rotary screen printing machine by visiting industries, and also edit the video as per process sequence.



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- 6) **Sample book:** Prepare a sample book of printed samples of cotton with various dyes, and printing styles and printing methods.

### Suggested Activities for Students:

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

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