

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**Course Curriculum  
DYEING TECHNOLOGY FOR NATURAL TEXTILE  
(Course Code: 3332802)**

<b>Diploma Program in which this courses offered</b>	<b>Semester in which offered</b>
Textile Processing Technology	3 <sup>rd</sup> Semester

### 1. RATIONALE

The polytechnic graduates are required to supervise operations of fibre, yarn and fabric dyeing processes in industry. They should have basic knowledge and skills to handle dyeing processes. This course on Dyeing Technology of Natural Textile has been designed to provide basic knowledge and skills as well as recent technological developments in the area of various dyes and auxiliaries related to the dyeing of natural fiber fabrics. It is therefore a key course which students should learn sincerely.

### 2. COMPETENCY

The course content should be taught and implemented with the aim to achieve different types of skills so that students are able to acquire following competency:

- Plan and supervise dyeing and finishing of natural fibers and fabrics using knowledge and skills of dyes, chemicals, equipment and processes.

### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	200
4	-	4	8	70	30	40	60	

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Student Activity; P - Practical; C – Credit;; ESE - End Semester Examination; PA - Progressive Assessment.

#### 4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I General Aspects of Dyeing</b>	1a. Describe concepts related with dyeing 1b. Classify dyes according to their dyeing methods and properties 1c. Describe mechanism of dyeing. 1d. Describe chemistry of dyes and fibers.	1.1 Definition of Dye, Dyeing, Pigment, etc. 1.2 Terminology of Dyeing:- Percent Shade, Self Shade, Compound Shade, Material to liquor ratio (M:L R), Percent exhaustion, Affinity, Substantivity, Standing bath, Topping, Stripping, different fastness properties etc. 1.3 Classification of Dyes according to their Application method. 1.4 Mechanism of Dyeing:- Adsorption, Diffusion, Fixation 1.5 Different types of the bond formation between different dyes & Fibres.
<b>Unit– II Application of Various Dyes on Natural and Regenerated Fibers</b>	2a. Describe nature, and Properties of different dyes. 2b. Describe applications of different dyes used for Natural fiber fabrics. 2c. Describe different auxiliaries used for dyeing process. 2d. Explain various parameters affecting the dyeing processes. 2e. Describe after treatment of dyed materials. 2f. Explain stripping of various dyes.	2.1 Properties and nature of various dyes. 2.2 Different dyes and their application methods for cellulosic fibres (Direct, Reactive, Vat, Azoic, Solublised vat, Sulphur, Pigment, Aniline black, Mineral Khaki, etc) 2.3 Different dyes and their application methods for wool & Silk (Acid, Basic, Metal – complex, acid mordant, etc.) 2.4 Role of Different Chemicals and auxiliaries used for different dyeing processes 2.5 Various parameters affecting the dyeing processes 2.6 After treatments of dyed material 2.7 Stripping of various dyes from dyed material
<b>Unit– III Machineries Used for Dyeing</b>	3a. Explain principle, construction & working of machines for dyeing of yarn & fabrics. 3b. Compare these yarn & fabric dyeing machines. 3c. Describe various faults, causes and remedies in dyeing machines & processes.	3.1 Principle, construction and working of loose fibre, yarn and fabric dyeing machines 3.3 Merits & demerits of various dyeing machines 3.2 Possible faults in Jigger, winch, package dyeing & Padding mangle with their causes and remedial processes
<b>Unit– IV Dyeing of Denim Warp Yarns</b>	4a. Describe basic raw materials required for dyeing of denim warp yarn 4b. Explain different dyeing machineries used	4.1 Conditions and requirement for Indigo dyeing 4.2 Preparation of Stock vat of Indigo dye 4.3 Preparation of dye bath of Indigo dye 4.4 Types of dyeing machines

Unit	Major Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Learning (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
		for denim dyeing.	(a) Rope form dyeing machine (b) Sheet form dyeing machine 4.5 Comparison of rope dyeing plant and sheet dyeing plant with their merits and demerits
<b>Unit – V Innovation in Textile Dyeing</b>	5a. Explain process chemistry & application of newly invented dyes for dyeing of textile substrates.		5.1 Natural Dyes 5.2 Reactive Dyes 5.3 Jumbo jigger dyeing machine 5.4 Continuous Dyeing Range

## 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – .....Hours)			
			R Level	U Level	A Level	Total
I.	General Aspects of Dyeing	08	2	2	4	08
II.	Application of Various Dyes on Natural and Regenerated fibres	22	6	10	12	28
III.	Machineries Used for Dyeing	14	4	6	6	16
IV.	Dyeing of Denim Warp Yarns	06	2	4	4	10
V.	Innovation in Textile Dyeing	06	2	4	2	08
	<b>Total</b>	<b>56</b>	<b>16</b>	<b>26</b>	<b>28</b>	<b>70</b>

**Legends:** R = Remember; U = Understands A = Apply and above levels (Bloom's revise taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

## 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

**Note:** Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Hours
1	II	Apply direct dyes on cotton yarn/fabric	02
2	II	Perform after treatment of direct dyed material	02
3	II	Apply Hot brand Reactive dyes on cotton fabric by exhaust methods	02
4	II	Apply cold brand Reactive dyes on cotton fabric by exhaust methods	02
5	II	Apply vinyl sulphone (Reactive) dyes on cotton fabric by exhaust methods	02
6	II	Apply Reactive dyes on cotton by CPB method	02
7	II	Apply Reactive dyes on cotton by PDC method	02
8	II	Apply of Reactive dyes on cotton by PDS method	02
9	II	Apply vat dye on cotton fabric by I <sub>N</sub> method	02
10	II	Apply vat dye on cotton fabric by I <sub>W</sub> method	02
11	II	Apply vat dye on cotton fabric by I <sub>K</sub> method	02
12	II	Apply solublised vat dye on cotton/viscose rayon fabric	02
13	II	Apply azoic colour on cotton fabric	02
14	II	Apply basic dyes on cotton fabric	02
15	II	Apply sulphur dye on cotton fabric	02
16	II	Apply pigment colour on cotton fabric	02
17	II	Dye wool with acid, metal complex, reactive or basic dyes	08
18	II	Dye silk with acid, metal complex, reactive or basic dyes	08
19	II	Apply azoic colour, pigment, vat dye, reactive dye on viscose rayon fabric	08
20	II	Match the given dyed sample with Direct, Vat and Reactive dyes	04
21	IV	Dye denim with indigo dyes	02
22	IV	Dye denim yarn with sulphur dyes	02
<b>Total</b>			<b>62 Hours</b>

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed students activities like:

- i. Literature survey of Basic dyeing technology for natural textile substrate.
- ii. Collection and Study of different dyes suitable for dyeing of natural textile substrate.
- iii. Group discussion on recent textile dyes.
- iv. Visit to textile processing plants, & Collection of data of various textile dyeing process & Power point Presentation.
- v. Seminar/Quiz/Presentation on recent developments in the field of Textile Dyeing.

## 8. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

- i. Arrange a visit to nearby industry for industrial demonstration of dyeing process & Machineries
- ii. Visual demonstration of dyeing process
- iii. Self internet based assignment on current dyeing practices
- iv. Guest lecturers from industry experts for contemporary practices in industries.

## 9. SUGGESTED LEARNING RESOURCES

### A. List of Books

Sr. No.	Author	Title of Books	Publication
1	Dr. V. A. Shenai	Chemistry of Dyes and Principles of Dyeing (VOLUME-II)	Sevak Publication
2.	Dr. V. A. Shenai	Technology of Dyeing (VOLUME-VI)	Sevak Publication
3	E. R. Trotmann	Dyeing and Chemical Technology of Textile fibre	Hodder Arnold, London
4	S. V. Gokhale	Cotton Piece Dyeing	Ahmedabad Textile Industry's Research Association
5.	R. S. Prayag	Bleaching, Mercerising & Dyeing of Cotton Material	Shree J. Printers, Pune
6.	R. S. Bhagwat	Handbook of Textile Processing Machinery	Colour Publication PVT. LTD., Mumbai
7	Dr. M.S. Parmar Shree S.S. Satsangi Dr. Jai Prakash	Denim – A Fabric for all (Dyeing - Weaving - Finishing)	Northern India Textile Research Association, Ghaziabad
8	S. R. Karmakar	Chemical Technology in the Colouration of Textiles VOL – 1	Colour Publication PVT. LTD., Mumbai

### B. List of Major Equipment/ Instrument

- i. Lab. Winch dyeing machine
- ii. Lab. Jigger dyeing machine
- iii. Water heating bath
- iv. Laboratory Oven
- v. Padding Mangle

### C. List of Software/Learning Websites

- i. [en.wikipedia.org/wiki/Textile\\_dyeing](http://en.wikipedia.org/wiki/Textile_dyeing)
- ii. <http://textilefashionstudy.com>
- iii. <http://textilelearner.blogspot.in>
- iv. <http://www.niir.org>

**10. COURSE CURRICULUM DEVELOPMENT COMMITTEE****Faculty Members from Polytechnics**

- **Prof. R. G. Patel**, Lecturer, Textile Processing Dept., R C Technical Institute, Ahmedabad.
- **Prof. R. M. Pandya**, Lecturer, Textile Processing Dept., Dr. S & S S Gandhi College of Eng. & Tech., Surat.
- **Prof. C. R. Madhu**, Ad-hoc Lecturer, Textile Processing Dept., R C Technical Institute, Ahmedabad.
- **Prof. A. S. Shah**, Assistant Lecturer, Textile Processing Dept., Dr. S & S S Gandhi College of Eng. & Tech., Surat

**Coordinator & Faculty Members from NITTTR Bhopal**

- **Dr. C. K. Chugh**, Professor, Department of Mechanical Engineering
- **Dr. S. K. Gupta**, Professor and Coordinator for State of Gujarat