

## GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN DDGM
PROGRAMME CODE	08
COURSE TITLE	TEXTILE CHEMISTRY
COURSE CODE	SC21201
PREREQUISITE COURSE CODE & AND TITLE	

## I. LEARNING &amp; ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration Hrs.	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TSL		Based on SL					
			CL	TL	LL					FA-TH	SA-TH	Total	Practical		SLA					
													FA-PR	SA-PR	Max	Min	Max	Min		
SC21201	TEXTILE CHEMISTRY	SEC	03	-	02	-	05	2.5	3	30	70	100	40	25	10	25@	10	-	-	150

Total IKS Hrs for Term: Nil Hrs

**Abbreviations:** CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

**Legends:** @-Internal Assessment, #- External Assessment,\*# - Online Examination,@\$ - Internal Online Examination

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \*Self-learning includes micro-projects/assignments/other activities.

## II. RATIONALE:

Textile chemistry is a highly specialized field of chemistry that applies the principles of materials. It is an application of basic knowledge of chemistry to understand textile materials and the physical, and chemical properties of fibers by studying relevant chemical finishes, dyes, and bleaches to increase the quality of fiber. Students should be aware of various basic parameters for quality fibers. The study of impurities and hardness in water and methods for water softening will help the students make proper use of water. Chemistry in textiles plays a major and vital role in fiber/yarn/fabric processing, synthetic fiber manufacturing, and polymerization reactions.

## III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve and demonstrate the following CO's on completion of course-based learning

- CO 1. Identify the physical and chemical properties of fibers.
- CO 2. Select chemical finishes for given fiber.
- CO3. Use dyes according to chemical properties.
- CO 4 Select relevant bleach in relevant industrial applications.
- CO 5. Use relevant water treatment processes to solve industrial problems.
- CO 6. Select relevant cleaning agent and stiffening agent for relevant fiber.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I TEXTILE FIBERS (CL Hrs-09, Marks-14 )</b>				
1.	<p><b>TLO 1.1</b> Define textile fiber.</p> <p><b>TLO 1.2</b> State characteristics of textile fibers.</p> <p><b>TLO 1.3</b> Classify fibers on the basis of their source.</p> <p><b>TLO 1.4</b> State physical and chemical properties of fibers.</p> <p><b>TLO 1.5</b> Compare fibers based on physical and chemical properties</p>	<p><b>1.1.</b> Definition of textile fibers, classification of fiber based on its source.</p> <p><b>1.2</b> Physical and chemical properties of cotton, linen, wool, silk, asbestos fiber, nylon, polyester, and acrylic.</p> <p><b>1.3</b> Physical properties: composition, structure, length, strength, moisture absorption, shrinkage, resiliency, heat conductivity</p> <p><b>1.4</b> Chemical properties: the action of acids, the action of alkalis, the action of bleach, and affinity for dyes</p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO1
<b>UNIT-II FINISHES (CL Hrs -08, Marks-10)</b>				
2	<p><b>TLO 2.1</b> Define finishes</p> <p><b>TLO 2.2</b> State purposes of finishing</p> <p><b>TLO2.3</b> Classify finishing based on textile processing.</p> <p><b>TLO 2.4</b> Describe the preliminary treatment involved in finishing</p> <p><b>TLO 2.5</b> Explain the effects of chemical finishes on fibers</p> <p><b>TLO 2.6</b> Distinguish between waterproof and water-repellent finishes.0</p>	<p><b>2.1</b> Definition of finishes, purposes of finishing.</p> <p><b>2.2</b> Classification of finishing based on textile processing (mechanical finishes, chemical finishes)</p> <p><b>2.3</b> Preliminary treatment involved finishing, bleaching, scouring, singeing, and desizing.</p> <p><b>2.4</b> Chemical finishes: mercerizing, Crease resistance, fire proof, and water proof, water repellent</p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO2
<b>UNIT-III DYES (CL Hrs-06, Marks-10)</b>				
3	<p><b>TLO 3.1</b> Define dyes</p> <p><b>TLO 3.2</b> Classify dyes according to their sources.</p> <p><b>TLO 3.3</b> List the types of dyes.</p> <p><b>TLO 3.4</b> Select relevant dyes for different fibers.</p> <p><b>TLO 3.5</b> Draw a process flow chart of dyeing materials.</p>	<p><b>3.1</b> Definition of dye, classification of dyes according to their sources: natural dyes, vegetable, animal, mineral. Artificial dyes: direct or salt, basic, acidic, Sulphur, mordant, vat, disperse, reactive, azoic dye. Ecofriendly dyes for textiles. Impact of dyes on environment&amp; way to reduce.</p> <p><b>3.2</b> Dyes applied to fiber classes-cellulose fiber, polyamide, polyester, acrylic mineral.</p> <p><b>3.3</b> Different processes and process flow chart showing dyeing textile material.</p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO3

<b>UNIT- IV BLEACHES AND THEIR SUITABILITY (CL Hrs-06, Marks-14)</b>				
4	<p><b>TLO 4.1</b> Define bleaching agent</p> <p><b>TLO 4.2</b> Classify bleaches</p> <p><b>TLO 4.3.</b>State Purposes of Bleaching</p> <p><b>TLO 4.4.</b> Describe the mechanism of bleaching</p> <p><b>TLO 4.5</b> Explain the action of oxidizing and reducing bleaches</p> <p><b>TLO 4.6</b> Describe over bleaching.</p>	<p><b>4.1</b> Definition of bleaching agent, classification of bleaches: oxidizing and reducing, Purposes of bleaching</p> <p><b>4.2</b> Mechanism of bleaching</p> <p><b>4.3</b>Types with examples Oxidizing bleaching: sodium hypo chloride, hydrogen peroxide, sodium perborate, potassium permanganate, sunlight</p> <p><b>4.4</b> Reducing bleaching: sodium sulphite, sodium Bisulphate, sodium thiosulphite,</p> <p><b>4.5</b> Over bleaching and precautions to avoid overbleaching.</p>	<p>Chalk and board</p> <p>Improved lecture,</p> <p>Tutorial</p> <p>Assignment</p> <p>Demonstration</p>	CO4
<b>UNIT –V WATER (CL Hrs-08, Marks-10)</b>				
5	<p><b>TLO 5.1</b> Define hard water and soft water</p> <p><b>TLO 5.2</b> State causes of hardness of water</p> <p><b>TLO 5.3</b> List types of hardness</p> <p><b>TLO 5.4</b> Explain the bad effects of hard water in dye and textile industries.</p> <p><b>TLO 5.5</b> Describe the method of removal of hardness by the zeolite process.</p> <p><b>TLO 5.6</b> Describe the method of removal of hardness by ion exchange method</p> <p><b>TLO 5.7</b> State applications of pH in engineering.</p> <p><b>TLO 5.7</b> Calculate the pH and pOH</p>	<p><b>5.1</b> Definition of hard water and soft water causes of hardness, types of hardness and difference between temporary and permanent.</p> <p><b>5.2</b> Bad effect of hard water in industries (textile, dye)</p> <p><b>5.3</b> Removal of hardness by lime soda method, zeolite, ion exchange method.</p> <p><b>5.4</b> Definition of pH &amp; pH scale, applications of pH in engineering. Numerical based on pH and pOH.</p>	<p>Chalk and board</p> <p>Improved lecture,</p> <p>Tutorial</p> <p>Assignment</p> <p>Demonstration</p>	CO5
<b>UNIT - VI MAINTAINANCE OF FIBRES (CL Hrs-08, Marks-12)</b>				
	<p><b>TLO6.1</b> List the components of soap and detergent.</p> <p><b>TLO 6.2</b> Describe the action of soap and detergent.</p> <p><b>TLO 6.3</b> Distinguish between soap and detergent.</p> <p><b>TLO 6.4</b> Describe the preparation of starch, gum, borax and gelatin solution.</p> <p><b>TLO 6.5</b> List types of blues.</p> <p><b>TLO 6.6</b> Explain the bluing process and classify stains.</p> <p><b>TLO 6.7</b> Select a proper method of stain removal for different fabrics.</p>	<p><b>6.1</b> Cleaning agent: soap- chemical composition, action of soap. Detergent: chemical composition, action of detergent Difference between soap and detergent</p> <p><b>6.2</b> Stiffening agent: starch, gum, gelatin, borax, Preparation and application of starch solution, (Boiling water starch, Cold water starch) gum, borax, and gelatin.</p> <p><b>6.3</b> Whitening agent: Laundry blues, types of blues, bluing process Stain removal- Classification of stains, methods of removal of stains from different fabrics</p>	<p>Chalk and board</p> <p>Improved lecture,</p> <p>Tutorial</p> <p>Assignment</p> <p>Demonstration</p>	CO6

## V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	<b>LLO 1.</b> Determine longitudinal and cross sections of fiber (cotton, linen wool, silk nylon, polyester, and acrylic) by using pick glass.	Determination of longitudinal and cross sections of fiber (cotton, linen wool, silk nylon, polyester, and acrylic) by using pick glass.	2	CO1
2	<b>LLO 2.</b> Compare characteristics of fibers (cotton, linen wool silk nylon, polyester, and acrylic) by the burning test of fibers in flame	Comparison of characteristics of fibers (cotton, linen wool silk nylon, polyester, and acrylic) by the burning test of fibers in a flame	2	CO 1
3	<b>LLO 3.</b> Compare characteristics of fibers (cotton, linen wool silk nylon, polyester, and acrylic) by solubility test in the chemical reagent.	Comparison of characteristics of fibers (cotton, linen wool silk nylon, polyester, and acrylic) by Solubility test in the chemical reagent.	2	CO 1
4	<b>LLO 4.</b> Removal of water-soluble sizes	Removal of water-soluble sizes	2	CO 1
5	<b>LLO 5.</b> Prepare a process flow chart showing dyeing textile material. (Sample collection of fabrics.)	Preparation of process flow chart showing dyeing textile material. (Sample collection of fabrics.)	2	CO 3
6	<b>LLO 6.</b> Bleaching of cotton and silk by using hydrogen peroxide.	Bleaching of cotton and silk by using hydrogen peroxide.	2	CO 4
7	<b>LLO 07.</b> Determine the hardness of the given water sample by the EDTA method.	Determination of hardness of given water sample by EDTA method.	2	CO 5
8	<b>LLO 08.</b> Determine chlorine hardness of water by Mohr's method.	Determination of chlorine hardness of water by Mohr's method.	2	CO 5
9	<b>LLO 09.</b> Determine water hardness by using a Soap test	Determination of water hardness by using a Soap test	2	CO 5
10	<b>LLO 10.</b> Determine Stain removal of different fabrics by using acid and base or white petrol	Determination of Stain removal of different fabrics by using acid and base or white petrol.	2	CO 6

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
11	<b>LLO 11</b> Prepare starch, borax and gelatin solutions.	Preparation of starch, borax and gelatin solutions.	2	CO 6
12	<b>LLO 12</b> Dying of cotton with natural dyes.	Dying of cotton with natural dyes.	2	CO 3

**Note:** A suggestive list of practical LLOs is given in the table, more such practical LLOs can be added to attain the COs and competency. A compulsory of 12 experiments or more for textile chemistry practical LLOs needs to be performed so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry. Hence, the 'Process' and 'Product' related skills associated with each LLOs of the laboratory work are to be assessed according to a suggested sample of Performance Indicators (Weightage in %) as follows:

- 1) Preparation of experimental set up 20%
- 2) Setting and operation 20%
- 3) Safety measures 10%
- 4) Observations and Recording 10%
- 5) Interpretation of result and Conclusion 20%
- 6) Answer to sample questions 10%
- 7) Submission of the report in time 10%.

#### VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT(SELF-LEARNING)

**Micro project:**

**NOT APPLICABLE**

**Assignment:**

**NOT APPLICABLE**

#### VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Magnifying glass (pick glass)	01
2	Electronic balance with the scale range of 0.001 gm to 500 gm	10,11

**VIII. SUGGESTED FORWEIGHTAGETO LEARNING EFFORTS & ASSESSMENT PURPOSE**

(Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R - Level	U - Level	A - Level	Total Marks
1	I	TEXTILE FIBRES	CO 1	09	08	04	02	14
2	II	FINISHES	CO 2	08	04	04	02	10
3	III	DYES	CO 3	06	06	02	02	10
4	IV	BLEACHES AND THEIR SUITABILITY	CO 4	06	06	04	04	14
5	V	WATER	CO 5	08	04	04	02	10
6	VI	MAINTAINANCE OF FIBRES	CO 6	08	06	02	04	12
<b>Grand Total</b>				<b>45</b>	<b>34</b>	<b>20</b>	<b>16</b>	<b>70</b>

**IX. ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Two Unit Tests of 30 marks and the average of two unit tests. For Laboratory Learning 25 MARKS	End Semester assessment of 25 marks for laboratory learning. End Semester assessment of 70 marks (Online)

**X. SUGGESTED COs- POs MATRIX FORM**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline - Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	-	1	-	-	1	-	-
CO2	3	2	1	-	1	-	-	1	-	-
CO3	3	2	1	1	1	-	-	1	-	-
CO4	3	2	1	1	1	-	-	1	-	-
CO5	3	2	1	-	1	-	-	1	-	-
CO6	3	2	1	-	1	-	-	1	-	-

Legends:-High:03,Medium:02,Low:01,NoMapping:-

\*PSOs are to be formulated at the institute level

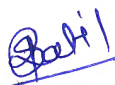
**XI.SUGGESTED LEARNING MATERIALS/BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	V.P. Mehta	Polytechnic Chemistry	Jain brothers, New Delhi.
2	P.C. Jain and Monica Jain,	Applied Chemistry	Dhanpat Rai and Sons, New Delhi,2015, ISBN: 9352160002
3	S.N. Narkhede	Applied Chemistry	, M. M. Thatte, Nirali Prakashan Pune.
4	Shina Gupta, Renu Garg, Renusaini	Textbook of clothing and laundry	Shina Gupta, Renu Garg, Renusaini
5	SNDT Home science for F.Y.J.C	Elements of Textile Chemistry	SNDT Home science

**XII. LEARNING WEBSITES & PORTALS**

Sr.No	Link/Portal	Description
1	<a href="https://en.wikipedia.org/wiki/Textile_Manufacturing">https://en.wikipedia.org/wiki/Textile_Manufacturing</a>	Manufacturing process and methods
2	<a href="https://textilelearner.blogspot.com/2012/02/textile-manufacturing-process-process.html">https://textilelearner.blogspot.com/2012/02/textile-manufacturing-process-process.html</a>	Fibers textile materials.
3	<a href="https://en.wikipedia.org/wiki/List_of_textile_fibres">https://en.wikipedia.org/wiki/List_of_textile_fibres</a>	Types of fibers
4	<a href="https://en.wikipedia.org/wiki/Finishing_(textiles)">https://en.wikipedia.org/wiki/Finishing_(textiles)</a>	Finishing methods
5	<a href="http://apsacwestridge.edu.pk/assets/admin/upload/notes/Classification_of_Dyes.pdf">http://apsacwestridge.edu.pk/assets/admin/upload/notes/Classification_of_Dyes.pdf</a>	Classification of dyes


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