Government Polytechnic, Pune

'180 OB' – Scheme

Programme	**Diploma in Dress Designing and Garment Manufacturing**
Programme code	01/02/03/04/05/06/07/**08**/15/16/17/18/19/21/22/23/24/26
Name of Course	**Textile Chemistry**
Course Code	**SC2107**
Prerequisite	**NA**
Class Declaration	**No**

1. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Practical		Total Marks
L	T	P	C		ESE	PA	*ESE	PA	
03	00	02	05	Marks	80	20	25	25	150
				Exam Duration	3 Hrs.	1 Hr	--	--	--

(*)PE:(Practical examination)

Legends: **L**- lecture, **T**-Tutorial, **P**-practical, **C**- Credits, **ESE**-End semester examination, **PA**- Progressive Assessment (Test I, II/Term Work), *****- Practical Exam**, $**-Oral Exam, #-Online Examination, Each Lecture/Practical period is of one clock hour.

2. RATIONALE

Identify chemical properties of fibers by studying relevant chemical finishes, dyes, bleaches for increasing quality of fiber. Students should be aware of various basic parameters for quality fibers. Study of impurities and hardness in water and methods for water softening will help the students to make proper use of water.

3. COMPETENCY

The aim of this course is to help the students to attain the following competency through various teaching learning experiences.

- **Apply principles of textile chemistry to identify and maintain the quality of fibers.**

4. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following COs associated with the above mentioned competency:

1. Identify physical and chemical properties of fibers.
2. Select chemical finishes for given fiber.
3. Use dyes according to chemical properties.
4. Use relevant water softening process to solve industrial problems.
5. Select relevant cleaning agent.

5. SUGGESTED PRACTICALS/ EXERCISES

Sr. No.	Unit No.	PrOs (Outcomes in Psychomotor Domain)	Relevant CO	Approximate Hours Required.
1.	1	* Determine longitudinal and cross section of fiber (cotton, linen wool, silk nylon, polyester, and acrylic) by using pick glass.	1	04
2.		Compare characteristics of fibers (cotton, linen wool, silk nylon, polyester, and acrylic) by burning test of fibers in flame	1	04
3.		*Compare characteristics of fibers (cotton, linen wool, silk nylon, polyester, and acrylic) by Solubility test in chemical reagent.	1	04
4.	2	Removal of water-soluble sizes.	2	02
5.	3	Prepare a process flow chart showing dying textile materials. (Sample collection of fabrics.)	3	02
6.	4	Bleaching of cotton and silk by using hydrogen peroxide.	4	04
7.	5	Determine hardness of given water sample by EDTA method.	5	02
8.		Determine chlorine hardness of water by Mohr's method.	5	02
9.		Determine water hardness by using Soap test	5	02
10.	6	Stain removal of different fabrics by using acid and base or white petrol.	6	02
11.		Prepare starch, borax and gelatin solutions.	6	04
12	1TO 6	*Complete a Micro- project as per the guidelines in point no. 11	1 to 6	04
		Total Hrs.		**32**

*** Expt.No.12 compulsary, Perform Expt .No.1 or 3**

Sr.No.	Performance Indicators	Weight age in %
a.	Prepare experimental set up and chemicals required	20
b.	Handling of instruments and chemicals during performing practical.	20
c.	Follow Safety measures	10
d.	Accuracy in calculation and comparison and result	10
e.	Answers to questions related with performed practices.	20
f.	Submit journal report on time	10
g.	Follow Housekeeping	10
Total		**100**

6.MAJOR EQUIPMENT/ INSTRUMENTSREQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practical, as well as aid to procure equipment by authorities concerned**.**

Sr.No.	Major Equipment/ Instruments Required	Expt.No.
1	Magnifying glass (pick glass.)	10
2	Digital Electronic Balance	01

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
UNIT 1. TEXTILE FIBERS (08hrs, 16marks)	
1a. Define textile fiber. 1b. State characteristics of textile fibers. 1c. Classify fibers on the basis of their sources. 1d. State physical and chemical properties of fibers. 1e. Compare fibers on the basis of physical and chemical properties.	**1.1**Definition of textile fibers, classification of fiber based on its source. **1.2** Physical and chemical properties of cotton, linen, wool, silk, asbestos fiber, nylon, polyester, acrylic. **1.3**Physical properties: composition, structure, length, strength, moisture absorption, shrinkage, resiliency, heat conductivity **1.4** Chemical properties: action of acids, action of alkalis action of bleach, affinity for dyes.
UNIT 2. FINISHES (09hrs, 12marks)	
2aDefine finishes. 2b. State purposes of finishing. 2c. Classify finishing based on textile processing. 2d. Describe preliminary treatment involved in finishing. 2e Explain effects of chemical finishes on fibers. 2f. Distinguish between Waterproof and Water repellent finishes.	**2.1** Definition of finishes, purposes of finishing. **2.2** Classification of finishing on the basis of textile processing (mechanical finishes, chemical finishes) **2.3** Preliminary treatment involved in Finishing, Bleaching, Scouring, Singing, Desizing. **2.4** Chemical Finishes: Mercerizing, Crease resistance, Fire proof, and Water proof, Water repellent
UNIT 3. DYES (09hrs, 12marks)	
3a. Define dyes 3b. Classify dyes according to their sources. 3c. List the types of dye. 3d. Select relevant dyes for different fibers. 3e. Draw flow chart showing different processes in dyeing textile materials**.**	**3.1**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. **3.2**Dyes applied to fiber classes-cellulose fiber, polyamide, polyester, acrylic, mineral. **3.3**Process flow chart showing dyeing textile material.

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
UNIT 4. BLEACHES AND THEIR SUTABILITY (08hrs, 16marks)	
4a. Define bleaching agent 4b. Classify bleaches 4c. State Purposes of bleaching 4d. Describe mechanism of bleaching 4e. Explain the action of oxidizing and reducing bleaches 4f. Describe over bleaching.	**4.1**Definition of bleaching agent, classification of bleaches: oxidizing and reducing, Purposes of bleaching. **4.2** Mechanism of bleaching. **4.3**Oxidizing: sodium hypo chloride, hydrogen peroxide, sodium per borate, potassium permanganate, sunlight. **4.4**Reducing: sodium sulphite, sodium bisulphate, sodium thiosulphite, **4.5**Over bleaching.
UNIT 5.WATER (06hrs 12marks)	
5a. Define hard water and soft water 5b. State causes of hardness of water 5c. List types of hardness. 5d. Explain the bad effects of hard water in dye and textile industries. 5e. Describe the method of removal of hardness by lime soda and zeolite process. 5f.Describe the method of removal of hardness by ion exchange method. 5g.State applications of p^H in engineering. 5h.Calculate the p^H and p^{OH}.	**5.1**Definition of hard water and soft water ,causes of hardness, types of hardness. **5.2**Bad effect of hard water in industries (textile, dye) **5.3**Removal of hardness by lime soda method, zeolite, ion exchange process. **5.4**p^H scale, applications of p^H in engineering. Numerical based on p^H and P^{OH}.
UNIT6.MAINTAINANCE OF FIBRES (08hrs, 12marks)	
6a. List the consttuents of soap and detergent. 6b. Describe action of soap and detergent. 6c. Distinguish between soap and detergent. 6d. Describe preparation of starch, gum, borax and gelatin solution. 6e. List types of blues. 6f. Describe bluing process. 6g. Classify stains. 6h. Select proper method of stain removal for different Fabrics.	**6.1**Cleaning agent: soap- chemical composition, action of soap. Detergent: chemical composition, action of detergent Difference between soap and detergent. **6.2**Stiffening agent: starch, gum, gelatin, borax, Preparation and application of starch solution, (Boiling water starch, Cold water starch) gum, borax, and gelatin. **6.3**Whitening agent: Laundry blues, types of blues, bluing process Stain removal- Classification of stains, methods of removal of stains from different fabrics.

8 SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Textile Fibres	8	10	6	0	16
II	Finishes	9	6	4	2	12
III	Dyes	9	6	4	2	12
IV	Bleaches And Their Sutability	8	8	4	4	16
V	Water	6	6	4	2	12
VI	Maintaince of Fibres	8	6	2	4	12
Total		**48**	**42**	**24**	**14**	**80**

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity

a. Prepare journals based on practical performed in laboratory.
b. Prepare a chart showing different dyes with their application for different textile materials.
c. Search information about new synthetic textile fibers.
d. Prepare posters to illustrate the use of different fibers.

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
c. With respect to item No.8, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
d. Teacher should ask the students to go through instruction and Technical manuals

11. SUGGESTED MICRO-PROJECTS

Only **one micro- project** is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.*** S/he ought to submit it by the end of the semester to develop the industry oriented COs .Each micro project should encompass two or more COs which are in fact, an integration of PrOs .UOs and ADOs .(Affective Domain Outcomes) .The micro project could be application based, internet based, workshop based ,laboratory based or field based. Each student will have to maintain dated work dairy consisting of individual contribution in the project work.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

1. Prepare a chart showing longitudinal and cross section of fiber (cotton, linen ,wool, silk nylon, polyester, and acrylic) by using pick glass.
2. Prepare a flow chart showing dying textile material (sample collection of textiles)
3. Collect and analyse different water samples from different sources.
4. Prepare a chart showing suitable methods of stain removal for different fabrics.

12 . SUGGESTED LEARNING RESOURCES

Sr.No.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Polytechnic Chemistry	V.P. Mehta, Jain brothers, New Delhi.2017	978818360093X
2	Engineering Chemistry	P.C.Jain and Monica Jain, Dhanpat Rai and sons, New Delhi.2019	9789352166411
3	Applied Chemistry	S.N.Narkhede, M. M. Thatte, NiraliPrakashan, Pune.2003	B07HN6ZLBM
4	Text book of clothing and laundry	Sushma Gupta, Neenu Garg, Kalyani,2018	9327294475
5	Textile Chemistry	Vishu Arora,Abhishek,2011	818247308X
6	Textile Chemical Processing	CBSE Class 12, Student Handbook and practical manual	Student Handbook and practical manual

13. SOFTWARE/LEARNING WEBSITES

1. https://en.wikipedia.org/wiki/Textile manufacturing
2.https://textilelearner.blogspot.com/2012/02/textile-manufacturing-process-process.html
3.https://en.wikipedia.org/wiki/List_of_textile_fibres
4.https://en.wikipedia.org/wiki/Finishing_(textiles)
5.http://apsacwestridge.edu.pk/assets/admin/upload/notes/Classification of Dyes.pdf

14. PO/PSO - COMPETENCY- CO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	-	-	-
CO2	3	2	1	1	-	-	-
CO3	3	2	1	1	-	-	-
CO4	3	2	1	-	1	-	-
CO5	3	2	1	-		-	-

	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-

Sign: **Name: Mrs. K.V. Mankar** **(Course Expert)** **Mrs. S.A. Kakade** **(Course Expert)**	**Sign:** **Name:Mrs. N. S. Kadam** **(Head of the Department)**
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