

3.1 TEXTILE AUXILIARIES & CHEMICALS

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RATIONALE

Diploma holders in Textile Processing are required to do job in Production department, quality control section in the process house. In order to perform these job responsibilities, knowledge about various auxiliaries and chemicals used in different sections (bleaching, dyeing, printing & finishing), their nature, structure and uses are essential. Hence this subject.

DETAILED CONTENTS

1. Introduction (4 hrs)
 - Definition & advantages of textile auxiliaries
 - Selection of Textile auxiliaries
 - Classification of Textile auxiliaries

2. Processing Operations (14 hrs)

Study of various Textile Auxiliaries used in :

 - Spinning
 - Sizing
 - Desizing
 - Scouring and mercerizing
 - Bleaching
 - Dyeing-Wetting agents, dispersing agents, levelling agents, sequestering agents, Antifoaming agents, carriers, migration inhibitors, dye fixing agents, after washing agents, stripping agents-types and uses.
 - Printing

3. Surface Active Agents (6 hrs)
 - 3.1 Role of surface active agents
 - 3.2 Essential requirement of surfactant
 - 3.3 Classification of surface active agents

- General description with suitable examples on:
 - Anionic surfactants
 - Cationic surfactants
 - Non-ionic surfactants

- 4. Finishing Chemicals (24 hrs)
Various finishing auxiliaries along with uses:
 - Stiffening agents
 - Cross linking agents
 - Optical Brightness
 - Softeners
 - Water repellents
 - Flame retarding agents
 - Anti static agents
 - Soil release agents
 - Antipilling agents
 - Mothproofing, Proofing agents

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on understanding of basic concepts and various terms used in the subject. The teacher is expected to teach all the students the application of this subject area in various fields.

RECOMMENDED BOOKS

1. Textile Auxiliaries & Chemicals by A.A. Vaidya; ATIRA Publication
2. Technology of Finishing by Dr. VA Shenai, Sevak Publication
3. Textile Auxiliaries by Dr. VA Shenai, Sevak Publication
4. Textile finishing by J.T Marsh
5. Textile Finishing by Murphy; Abhishek Publication, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (hrs)	Marks Allocation (%)
1	04	12
2	14	30
3	06	10
4	24	48
Total	48	100

3.2 PHYSICAL AND ORGANIC CHEMISTRY

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RATIONALE

A Diploma holder in textile processing is required to supervise the processing of textiles in various sections. He is supposed to be aware of qualitative and quantitative aspects of chemistry. Hence this subject.

1. Colloids (6 hrs)
 - Introduction, types of colloidal solutions, characteristics of colloidal solutions (Mechanical, optical, electrical) coagulation of solution, Schulze-Hardy law, Protective colloids. Gold number, Emulsions and Gels, application of colloids.
 - Equivalent wt., Atomic wt. Their relationship, concentration of solution- Molarity, Molality, Normality

2. Kinetics of chemical Reactions (3 hrs)

Introduction, factors affecting rate of reaction, difference between order and molecularity of reaction, Kinetic equations of different orders.

3. Catalysis (3 hrs)

Introduction, types of catalysis, characteristics of catalytic reaction, Promoters, Auto catalysis, Theory of catalysis, Acid-base catalysis, Enzyme catalysis.

4. Chemical Equilibrium (4 hrs)

Concept of reversible reactions, chemical equilibrium and its characteristics, law of mass action, equilibrium constant, Le-chatelier's Principle-effect of change in concentration, Pressure and temperature. Application of Le-chatelier's principle in industry.

5. Acids and Bases: (14 hrs)
 - Concept of acid and bases- (1) Arrhenius concept (2) Bronsted loway (3) Lewis concept, relative strength of acid and bases. Concept of pH and its measurement by pH meter, pH scale, Relation between pH and pOH, concept of buffers and mechanism of buffer action
 - Types of reactions in organic chemistry: Organic compounds and their classification and nomenclature based on IUPAC system, Empirical and molecular formule and their calculation.
 - Detection of elements in organic compounds: Carbon, hydrogen, nitrogen, sulphur, halogens and oxygen. Detection of functional groups.

6. Aliphatic compounds (6 hrs)
- Properties and uses of alkanes, alkenes, alkynes, halogens derivatives, alcohols, amines, aldehydes, ketones, carboxylic acids, formic acid, acetic acid, oxalic acid, urea, glycerol, carbon tetra chloride.
7. Aromatic compounds (6 hrs)
- Introduction to coal and petroleum as sources of aromatic compounds, properties and uses of aromatic, hydrocarbon, benzene and toluene, halogen derivatives, hydroxy compound, nitro compounds, sulphonic acids, amino compounds, diazonium compounds, carboxylic acids and their derivatives.
8. Fats, oils, soaps and detergents (6 hrs)
- Introduction to fats and oils, their sources, chemical structure and composition, physical and chemical properties and their analysis. Introduction to soap and detergents, their chemical composition, mechanism of cleaning action of soaps and their limitations. Types of detergents, difference between soap and detergent.

PRACTICALS

1. Detection of Nitrogen, Sulphur, Chlorine, Bromine, and iodine in organic compounds.
2. Determination of functional groups in the given organic compounds (by any chemical test).
3. To measure pH of a solution by pH meter.
4. Volumetric exercises involving redox reactions using potassium permanganate and potassium chromate as standards.
5. To measure the viscosity of an oil by viscometer.

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on understanding of basic concepts and various terms used in the subject. The teacher is expected to teach all the students the application of this subject area in various fields.

RECOMMENDED BOOKS

1. A text book of organic chemistry by B.S. Bahl and Arun Bahl, S. Chand and Company Ltd., Delhi.
2. Organic chemistry by Morrison and Boyd, P.H.I of India Ltd., Delhi.
3. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Sons, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (hrs)	Marks Allocation (%)
1	06	14
2	03	06
3	03	06
4	04	08
5	14	24
6	06	14
7	06	14
8	06	14
Total	48	100

3.3 TEXTILE PHYSICAL TESTING

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RATIONALE

A diploma holder in Textile Processing is responsible for controlling the quality of the final finished product; for which he is supposed to know about physical testing of textiles. For this purpose, knowledge and skills about physical testing need to be imparted to him. Hence this subject.

DETAILED CONTENT

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| 1. Introduction to textile testing- Aim & scope. | (2 hrs) |
| 2. Sampling techniques. General requirement. | (2 hrs) |
| 3. Sampling techniques for yarn and fabrics for specific tests. | (2hrs) |
| 4. Relative humidity & methods of its determination. | (4 hrs) |
| 5. Importance of moisture content in textile materials and its determination. Standard moisture regains of different textile materials. | (4 hrs) |
| 6. Different yarn counts systems, their conversion and count calculations. Determination of count of yarn in different systems with the help of wrap reel, Beesley's balance, Quadrant balance, Knowle's yarn balance, yarn & cloth quadrant. | (8 hrs) |
| 7. Measurement of twist in spun, continuous filaments & ply yarns. | (6 hrs) |
| 8. Methods of tests for fabric dimensions & other physical properties, viz thickness, weight, crimp. | (6 hrs) |
| 9. Concept of pilling and its testing | (2 hrs) |
| 10. Air permeability & its measurement. | (2 hrs) |
| 11. Wettability, waterproof ness, water resistance and their measurement. | (4 hrs) |
| 12. Flammability flame resistance & its measurement. | (4 hrs) |
| 13. Fabric strength testing: tensile, tearing and bursting strength tests. Principle & operation of equipment. | (8 hrs) |
| 14. Fabric handle, stiffness & draping properties – Terminology and experimental methods. | (4 hrs) |

15. Serviceability, wear and abrasion – methods for measuring abrasion resistance and interpretation of results. (4 hrs)
16. Fabric creasing and crease recovery testing. (2 hrs)

LIST OF PRACTICALS

1. Twist in yarn: To find out the number of folds/twist per inch of single and ply yarn using twist tester.
2. To find out the yarn count with Beesley's balance, Quadrant balance, Knowle's yarn balance.
3. To find out Wt/sqm (GSM) of fabric using quadrant balance.
4. To find out moisture content and moisture regain of the given textile material by conditioning oven.
5. To find out the relative humidity by dry & wet bulb thermometer.
6. Determination of bursting strength of fabrics by using bursting strength tester.
7. To find breaking strength and elongation of fabrics on fabric breaking strength testing machine.
8. To find flammability of fabric using flammability tester.
9. To find crease recovery angle using crease – recovery tester.
10. To find physical dimensions of fabric viz length, width & thickness of the fabric.
11. To find crimp of the yarn by crimp testing machine.

INSTRUCTIONAL STRATEGY

This is a practical subject. The students should be taken for field visit to a textile mill for showing various testings.

RECOMMENDED BOOKS

1. Textile Testing by J.E. Booth; CBS Publication, New Delhi.
2. Textile Testing by Angappan Jayaparkashan, Publication.
3. Textile Testing by Grover and Hamby; Abhishek Publishers, Chandigarh.
4. Quality Evaluation of Textiles by R. Kadiyan and M. Nagpal – AG Publication, Ambala

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (hrs)	Marks Allocation (%)
1	02	4
2	02	4
3	02	4
4	04	6
5	04	6
6	08	12
7	06	8
8	06	10
9	02	4
10	02	4
11	04	6
12	04	6
13	08	10
14	04	6
15	04	6
16	02	4
Total	64	100

3.4 TECHNOLOGY OF BLEACHING - I

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RATIONALE

To effectively supervise the processing of textiles in bleaching section, a diploma holder in textile processing must know about principles of bleaching, operations, materials, equipments and processes. Hence this subject. The emphasis should be made on development of skills in bleaching through practice.

DETAILED CONTENT

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| 1. Natural and added impurities in cotton. | (2 hrs) |
| 2. Singeing, objectives and working of singeing machines. | (4 hrs) |
| 3. Desizing – purpose, desizing agents and desizing methods. | (4 hrs) |
| 4. Principles and process of scouring of cotton and coloured woolen goods. | (6 hrs) |
| 5. Description and working of high pressure kiers, J. Box and vapour lock machines. | (6 hrs) |
| 6. Washing and souring – purpose, counter current washing, tight and slack rope washing machines. | (6 hrs) |
| 7. Bleaching – Process of bleaching of cotton with bleaching powder, sodium hypo chlorite, hydrogen peroxides and sodium chlorite. Effect of pH on bleaching. Advantages of one method over other. | (10 hrs) |
| 8. Drying machines – Cylinder drying, stenter drying, and chamber drying. | (4 hrs) |
| 9. Mercerisation – Purpose, fundamentals, physical and chemical changes, mercerization of yarn and fabric. Mercerizing machines – pad chain, pad chainless machines. | (6 hrs) |

LIST OF PRACTICALS

1. Desizing of cotton by rot steep method.
2. Desizing of cotton by acid steeping method.
3. Desizing of cotton by enzyme steeping method.
4. To scour a given cotton sample.
5. To bleach cotton with bleaching powder.

6. To bleach cotton with sodium hypochlorite.
7. To bleach cotton with hydrogen peroxide.
8. To bleach cotton with sodium chlorite.
9. To mercerise given cotton sample.
10. Study of drying machines through industrial visit.

Note: Material used can be yarn/fabric.

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on understanding of basic concepts and various terms used in the subject. Practical exercises will reinforce various concepts. Industrial exposure must be given by organizing visits.

RECOMMENDED BOOKS

1. Technology of Bleaching by V.A. Shenai; Sevak Publication, Mumbai.
2. Scouring Bleaching and Mercerising by E.R. Trotman; B-I Publication, New Delhi.
3. Dyeing and Chemical Technology of Textile Fibres by E.R. Trotman, B-I Publication, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (hrs)	Marks Allocation (%)
1	2	4
2	4	8
3	4	8
4	6	10
5	6	14
6	6	12
7	10	20
8	4	10
9	6	14
Total	48	100

3.5 TECHNOLOGY OF DYEING -I

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3 - 3

RATIONALE

A diploma holder in textile processing must have sufficient knowledge and skills about principles of dyeing, operations, materials, equipment and processes. He should be able to execute various recipes for dyeing. Hence this subject.

DETAILED CONTENT

1. Definition and brief history of dyeing of textile. (2 hrs)
2. Classification of dyestuffs on the basis of methods of applications. (3hrs)
3. General terms and definitions used in technology of dyeing. (3hrs)
4. Sulphur dyes- Properties, classification on the basis of method of application, defects and remedies. (4hrs)
5. Vat Dyes-Properties , classification, application to cotton by different processes, dyeing of cotton yarn in form of cone by vat process, dyeing of cotton yarn by leuco vat process. Dyeing of cotton cloth by vat acid process(pad-jig method), Du- Pont(pad steam method). (10hrs)
6. Direct dyestuffs – Properties and application to cotton, wool and silk, after treatments of direct dyes. Dyed material to improve fastness properties. (4 hrs)
7. Solublized vat dyes Principles, Properties and application to cotton. (4hrs)
8. Reactive dyes- Types of Reactive Dyes, properties and application to cotton by different processers - Pad batch, continuous process, exhaust dyeing (12hrs)
9. Azoic- Principal of dyeing and application to cotton. (6hrs)

LIST OF PRACTICALS

1. Dyeing of cotton with direct dyes, (three dyes)
2. After treatments of direct dyed material.
3. Dyeing of cotton with sulphur dyes and aftertreatment.(three dyes).
4. Dyeing of cotton with vat dyes .(three dyes).
5. Dyeing of cotton with solublized vat dyes.(three dyes).
6. Dyeing of cotton with azoic class.(three dyes).

7. Dyeing of cotton with Reactive(hot brand) dyes .(three dyes).
8. Dyeing of cotton with Reactive(cold brand) dyes.(three dyes).
9. To study effect of temperature in direct dyes.
10. To study effect of salt in direct dyes.

INSTRUCTIONAL STRATEGY

This is a practical subject. The students should be taken for field visit to a textile mill for showing various testings.

RECOMMENDED BOOKS

1. Technology of Dyeing by V.A Shenai; Sevak Publication, Mumbai.
2. Dyeing and Chemical Technology of Textile Fibres by E.R Trotman; B.I Publication, New Delhi.
3. Printing and Dyeing of Fabric by James.
4. Chemistry and Principles of Dyeing by V.A Shenai; Sevak Publication, Mumbai.
5. Dyeing of Wool and Silk by R.S Paryag.
6. The Dyeing of Woolen fabrics by F. Beech; Abhishek Publication, Chandigarh.
7. Silk Dyeing, Printing and Finishing by Hurst; Abhishek Publication, Chandigarh.
8. Dyeing and Silk by Dr. V. A. Shenai; Sevak Publication, Mumbai.

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (hrs)	Marks Allocation (%)
1	2	4
2	3	6
3	3	6
4	4	8
5	10	22
6	4	10
7	4	10
8	12	24
9	6	10
Total	48	100

3.6 TECHNOLOGY OF PRINTING-I

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RATIONALE

A diploma holder in textile processing must have thorough knowledge about principles and practices employed for printing. He must be fully aware of various operations, materials, equipment and processes used for printing of textiles. Hence this subject.

DETAILED CONTENTS

1. Introduction to Textile Printing: (6 hrs)
Objectives, brief historical background, methods and styles.

Difference between
- Dyeing and printing
- Discharge and resist style
- Methods and style
2. Printing Paste (12 hrs)

Various ingredients of a printing paste and their objectives. Classification of dyes/colours used for printing. Classification of thickeners, Essential qualities of thickeners used in printing of textiles. Study of different thickeners in respect of their source, properties, general method of preparing stock thickening and their suitability for different fibres. Precautions to be taken during making of a printing paste.
3. Preparation of cloth for printing (3 hrs)

Outline of the different wet processes for preparation of different kind of fabrics to be printed.
4. Fixation and after treatments (10 hrs)

Objectives of ageing, steaming, curing, washing, soaping. Construction and working of rapid ager, high pressure steamer. Continuous steamer (fastoon steamer). Principle and Mechanism of High Temperature steaming (super heated steaming) and its advantages. Study of washing & soaping machines.
5. Block Printing (5 hrs)

Significance of Block Printing. Operation of block printing, Procedure of making of wooden blocks, metal blocks, pin blocks, casting blocks, colour blocks and their specific purpose. Advantages and limitations of block printing,

6. Stencils and Screen Printing (Manual) (5 hrs)

Concepts of stencils printing and its advantages. Photo chemical method of making screen for hand screen printing. Screen printing operation. Various equipment used in hand screen Printing. Various faults in screen printing, their causes and remedies.

7. Roller Printing (7 hrs)

Concept of Roller Printing. Study of various parts of roller printing machines and their objective, Methods of engraving of copper roller: Mill Engraving, Pantograph Engraving, Photo Engraving. Defects of Roller Printing machine , their causes and remedies. Advantages and limitations of Roller Printing.

LIST OF PRACTICALS

1. To prepare a thickening paste of sodium alginate guar gum in the lab and study the effect of acid and alkali on it.
2. To create a design by selecting a unit and its repeats on graph paper.
3. To make fabric sample on cotton using film stencils on the theme of flowers and leaves.
4. To make fabric sample on cotton using film stencils on the theme of geometric pattern.
5. To Print a cotton fabric sample by Block Printing in single colours.
6. To Print a cotton fabric sample by Block Printing in double colours.
7. To print a cotton fabric sample by pin blocks
8. To print a cotton fabric sample by screen printing in single colour.
9. To make a line diagram of the curing chamber and study its working and uses.

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on understanding of basic concepts and various terms used in the subject. Practical exercises will reinforce various concepts. Industrial exposure must be given by organizing visits.

RECOMMENDED BOOKS

1. Technology of Printing by Dr.V.A.Shanai ; Sewak Publications, Mumbai
2. Textile Printing by I.W.C. Miles

3. Textile Printing by Joyci Storey ; Thames & Hudson Ltd., London.
4. The creative guide to fabric screen printing by Pam stall ebrans; New Holland Publishers Ltd., 37, Connaught street, London
5. Principles of cotton printing by D.G. Kale, AITRA
6. The Principles and practice of Textile Printing by Knecht, E and Fothergill, J.B. London
7. A guide to printing Techniques by Bast, Japan

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Time Allotted (hrs)	Marks Allocation (%)
1	6	12
2	12	24
3	3	6
4	10	20
5	5	12
6	5	12
7	7	14
Total	48	100