GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code: DI01C28021(Only for C to D Students)

Course / Subject Name: Textile Fiber Science - I

w. e. f. Academic Year:	2024-25
Semester:	1st
Category of the Course:	ESC -02

Prerequisite:	A foundational understanding of textile fiber science requires prior knowledge in basic chemistry and physics. Students should be familiar with organic chemistry principles, including the structure and properties of polymers, as these are essential for understanding fiber formation and characteristics. Additionally, a grasp of fundamental physics concepts such as material properties will aid in comprehending the behavior of fibers under various conditions. Familiarity with basic textile terminologies and processes will also be required, enabling students to contextualize Their learning within the broader textile wet processing industry.
Rationale:	The knowledge of textile fibres is the basis of textile manufacturing & processing. To achieve the best quality of textile materials, the diploma engineers must have adequate knowledge of the morphological structure, chemical composition, physical & chemical properties of the various Natural & Synthetic fibres. They need to adopt a relevant methodology for the chemical processing of different fibres. They must also possess' knowledge about the application areas of the fibres. This course is developed in such a way by which fundamental information will help the diploma Engineers to apply the basic concepts of textile fibres to solve broad based problems in the textile industry.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify and classify the various textile fibres.	R
02	Relate the properties of cotton fibre for suitable chemical wet processes.	U+A
03	Relate the properties of Wool & Silk fibre for suitable chemical wet processes.	U+A
04	Relate the properties of Viscose Rayon fibre for suitable chemical wet processes.	U+A
05	Choose the sustainable textile fibre for suitable eco-friendly wet processes.	R+U

**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
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	1.1 Fiber forming Polymer: Monomers, Polymers, Repeat unit and Degree of polymerization 1.2 Textile Basic Terminology: Definition of fiber, staple fiber, filament, Moisture Content, Moisture Regain, Hydrophobic & Hydrophilic fibers, orientation: Amorphous & crystallinity. 1.3 Classification of fibers: Chemical & origin 1.4 Properties of fibers: Essential & Desirable 1.5 Yarn Numbering system; Tex, Denier & English count	06	22
2.	2.1 Cotton: varieties of cotton, Morphological structure 2.2 Cellulose: Chemistry of cellulose and chemical composition 2.3 Physical and chemical properties of cotton fiber 2.4 Chemistry of damage to cellulose: ox cellulose and hydrocellulose 2.5 Microscopically View (Longitudinal & Cross-sectional View) of cotton fiber 2.6 Application of cotton fiber	06	22

3.	3.1 Types and grading of wool 3.2 Chemical structure and composition of the wool fibre (Bonds present in wool and their effect on wet process) 3.3 Different types of silk 3.4 Chemical structure and composition of the silk fibre 3.5 Physical and chemical properties of Wool & Silk fibre 3.6 Microscopically View (Longitudinal & Cross-sectional View) of Wool & Silk fibre 3.7 Applications of wool & Silk fibre	06	22
4.	4.1 Introduction to regenerated & modified fibres (Viscose Rayon, polynosic fibre, Cup ammonium Rayon, Acetate rayon, Modal, Tencel, Lyocell) 4.2 Chemical technology & flow chart for viscose rayon manufacturing 4.3 Physical & Chemical Properties of viscose rayon 4.4 Microscopical view (Longitudinal & Cross sectional) of viscose rayon 4.5 Application of Viscose rayon	06	22
5.	5.1 Concept of sustainability in textile fibre 5.2 Some sustainable textile fibre • Jute fibre • Bamboo fibre • Linen fibre • Ramie Fibre • Organic Cotton 5.3 Microscopically view (Longitudinal & Cross sectional) of above sustainable textile fires Application of above fires	06	12
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
40	**40**	**20**	**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:

1	A Text-Book of Fibre Science & Technology	S. P. Mishra
2	Fibre Science & Technology	R. Gopalakrishnan, V. Kashinathan
3	Textile Fibers (Vol. – I)	V. A. Shenai

(b) Open source software and website:

1. http://www.onlineclothingstudy.com/2012/01/microscopic-view-of-natural-and-man.html
2. www.nptel.iitm.ac.in
3. https://ndl.iitkgp.ac.in
4. www.textileschool.com
5. www.textileguide.chemsec.com
6. www.textileassociationindia.org

Suggested Course Practical List: (30 Hours)

Sr. No.	Practical
1.	Identify the class of fibre by burning test. (Cellulosic Fibre)
2.	Identify the class of fibre by burning test. (Protein Fibre)
3.	Prepare a microscopically Views (Longitudinal & Cross sectional) of cotton fibre.
4.	Use chemical tests to identify cotton fibre.
5.	Determine moisture regain & moisture content of the given cotton fibre samples
6.	Prepare a microscopically Views (Longitudinal & Cross sectional) of Wool fibre.
7.	Use chemical tests to identify Wool fibre.
8.	Determine moisture regain & moisture content of the given Wool fibre samples
9.	Prepare a microscopically Views (Longitudinal & Cross sectional) of Silk fibre.
10.	Use chemical tests to identify Silk fibre.
11.	Determine moisture regain & moisture content of the given Silk fibre samples
12.	Prepare a microscopically Views (Longitudinal & Cross sectional) of Viscose Rayon fiber.
13.	Use chemical tests to identify Viscose Rayon fibre.
14.	Determine moisture regain & moisture content of the given Viscose Rayon fibre samples
15.	Prepare a microscopically Views (Longitudinal & Cross-sectional) of Linen fibre.
16.	Prepare a microscopically Views (Longitudinal & Cross-sectional) of Ramie fibre.
17.	Prepare a microscopically Views (Longitudinal & Cross sectional) of Jute fibre.
18.	A study of Physical & Chemical Properties of Cotton fibre.
19.	A study of Physical & Chemical Properties of Wool fibre.
20.	A study of Physical & Chemical Properties of Silk fibre.
21.	A study of Physical & Chemical Properties of Viscose Rayon.
22.	A Study of the morphological structure of cotton fibre.

23.	Prepare a detailed classification of Textile fibre.
24.	Calculate fineness of yarn using Direct System (Tex & Denier).
25.	Calculate fineness of yarn using Indirect system (English count).

List of Laboratory/Learning Resources Required:

1. Microscopes
2. Fiber Identification Kits
3. Mechanical Testing Instruments
4. Moisture Regain Testing Equipment
5. Chemical Reagents.

Suggested Project List:

1) Prepare a detailed classification of Natural Textile fibres on a full imperial sheet. Give example of each type of fibre with samples.
2) Prepare a Comparative table for physical properties of different natural fibres.
3) Prepare a Comparative table for Chemical properties of different natural fibres.
4) Study microscopic views of different Natural textile fibres.
5) Study on morphological structures of Natural textile fibres.
6) Applications of various natural textile fibres.
7) Study on important properties & terminologies of natural textile fibre forming polymer.
8) Draw life cycle of Silk warm and explain the same.
9) Explain reeling process of silk with the help of a diagram.
10) Prepare a chart showing different types of silk yarns produced during reeling, their method of numbering, number of constituent silk filaments, amount of twist, area of application.
11) Literature survey of sustainable natural textile fibres.
12) Study the concept of wool felting and its effects.
13) Prepare a report on silk degumming.

Suggested Activities for Students:

1) Cotton fibre staple length: Collect 5 different cotton samples & measure their lengths and present your results.
2) Wool fibre staple length: Collect 5 different wool samples & measure their lengths and present your results.
3) Silk filament length: Collect 5 different Silk samples & measure their lengths and present your results.
4) Viscose fibre staple length: Collect 5 different Viscose samples & measure their lengths and present your results.
5) Moisture regain & Moisture content: Collect 10 different natural fibres and measure its moisture content & moisture regain.