GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Designing

Course / Subject Code: DI01059041

Course / Subject Name: Fundamentals of Fiber Science

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

Prerequisite:	Basic information about textile materials used in day to day life, a keen interest in textiles and its applications in designs, creative thinking and have a willingness to explore about various fibers.
Rationale:	The textile designer should be aware of different fibers and their uses, which are helpful in designing/ engineering textile products as per needs of end user. The subject is essential to provide introductory knowledge and practice to perceive various kinds of the fibers (Natural & Manmade), its origin, structure, properties and manufacturing/production process, along with their properties. This knowledge will be useful for students when they work on designing, producing or modifying various designs and structures for knitted, woven, non-woven or embroidery on fabrics.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify various textile fibers based on their origin.	R
02	Select production of Natural fibers & understand their properties.	U
03	Select manufacturing process for manmade fibers & understand their properties.	U
04	Examine the textile fibers for their identification.	A, N

**Revised Bloom's Taxonomy (RBT)*

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

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction of Textile Fibers** 1.1 Definitions of Textiles & Fiber 1.2 Applications / Uses of textiles in various fields 1.3 Classification of textile fibers based on their origin. 1.4 Essential & Desirable properties of textile fibers.	6	20
2.	**Natural fibers** 2.1. Cotton fiber- origin, structure and their Processing, properties, uses/applications, advantages& disadvantages 2.2. Wool fiber - origin, structure and their Processing, properties, uses/ applications, advantages & disadvantages 2.3. Jute fiber - origin, structure and their Processing, properties, uses/ applications, advantages & disadvantages 2.4. Silk fiber - origin, structure and their Processing, properties, uses/ applications, advantages & disadvantages	6	25
3.	**Concept of Fiber formation & its processing** 3.1 Definition of Monomers, Polymers, Polymerization, Degree of polymerization 3.2 Principles of spinning methods i.e. Melt, Dry & Wet spinning 3.3 Processes of Filament to yarn Texturizing	6	10
4.	**Man-made fibers** 4.1 Manufacturing process of Regenerated fiber, raw materials, structure, uses/ applications, advantages & disadvantages(Viscose/ Acetate/ Triacetate/ Cup ammonium) 4.2 Manufacturing process of Polyester fiber, raw materials, structure, uses/ applications, advantages & disadvantages 4.3 Manufacturing process of Nylon fiber, raw materials, structure, uses/ applications, advantages & disadvantages 4.4 Importance & applications of other manmade fibers e.g. Acrylic, PP, PE, recently developed fibers, etc.	6	25
5.	**Fiber identification** 5.1 Microscopic test for fiber identification 5.2 Burning test for fiber identification 5.3 Chemical solubility test for fiber identification 5.4 Density test & Stain test for fiber identification	6	20
	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**
30	**40**	**20**	**10**	**-**	**-**

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:

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Introduction to Textile Fibres	H. V. S. Murthy	WPI India ISBN:9781315359335, 1315359332
2	Textile fibers	V.A.Shenai	Sevak Publications
3	Textiles and Fashion Materials, Design and Technology	Rose Sinclair	WoodheadPublishing ltd. ISBN: 9780857095619, 0857095617
4	Handbook of Textile Fibres	J. Gordon Cook	Woodhead Publishing ltd. ISBN:9781855734852
5	Handbook of Natural Fibres Volume 1: Types, Properties and Factors Affecting Breeding and Cultivation	Richard M. Kozlowski	WoodheadPublishing ltd. ISBN: 9780857095503, 0857095501
6	Handbook of Natural Fibres Volume 2: Processing and Applications	Richard M. Kozlowski	WoodheadPublishing ltd. ISBN: 9780128190708, 0128190701
7	Handbook of Textile Fibre Structure: Volume 2: Natural, Regenerated, Inorganic and Specialist Fibres	J. W. S. Hearle, T. Kikutani, M Jaffe, Stephen J. Eichhorn	WoodheadPublishing ltd. ISBN:9781845697303
8	Manmade Fibers	R. W. Moncrieff	Publisher- Wiley ISBN: 470613181,9780470613184
9	Identification of Textile Fibers	Max M Houck	WoodheadPublishing ltd. ISBN: 9781845695651,1845695658

S. No.	Title of Book	Author	Publication with place, year and ISBN
10	Physical Testing of Textiles	B. P. Saville	Wood headPublishing ltd. ISBN: 9781845690151
11	Physical Properties of Textile Fibers	J. W. S. Hearle and William Ernest Morton	WoodheadPublishing ltd. ISBN:9781845694425, 1845694422
12	Sustainable Fibres and Textiles	Subramanian SenthilkannanMuthu	Elsevier Science ISBN: 9780081020425, 0081020422
13	Biodegradable and Sustainable Fibres	Richard Blackburn	WoodheadPublishing ltd. ISBN: 9781845690991, 1845690990

(b) Open source software and website:

- https://nptel.ac.in/courses/
- http://www.textileworld.com/
- www.learningseed.com
- http://www.teonline.com/knowledge-centre/
- http://www.sitra.org.in
- http://www.btraindia.com
- www.nitratextile.org/
- https://www.britannica.com/technology/man-made-fiber
- https://www.britannica.com/topic/natural-fiber
- https://textilestudycenter.com/textile-books-free-donwload/
- http://www.textileassociationindia.org/
- http://www.cottonsjourney.com/Storyofcotton/page5.asp
- http://textilelearner.blogspot.in/
- https://textilestudycenter.com/
- https://study.com/academy/topic/textile-fibers-fabrics.html
- www.fibersource.com
- https://www.fibre2fashion.com/

Suggested Course Practical List:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Define Textiles, Fibre and study about "Applications of textiles" in various fields.	I	02
2	Prepare charts for Natural fiber& Man-made fiber classifications.	II	02
3	Describe the Cotton fibers, properties & its processes.		02
4	Describe the Wool fibers, properties & its processes.	II	02
5	Describe the Silk fibers, properties & its processes.	II	02
6	Describe the Jute fibers, properties & its processes.	II	02
7	Draw sketches and Explain spinning methods.	III	02
8	Draw a line diagram and explain the manufacturing stages for Viscose rayon fiber & its properties.	IV	03
9	Draw a line diagram and explain the manufacturing stages for Polyester fiber & its properties.	IV	02
10	Draw a line diagram and explain the manufacturing stages for Nylon fiber & its properties.	IV	03
11	Identification of textile fibres using microscope and draw their longitudinal & cross sectional views.	V	02
12	Prepare a chart &Perform burning test for identification of textile fibers.	V	02
13	Prepare a chart &Perform chemical dissolution tests for identification of textile fibers.	V	02
14	Prepare a chart &Perform Density test and stain tests for identification of textile fibers.	V	02
	Total		**30**

List of Laboratory/Learning Resources Required:

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Natural fibres spinning process setup	1 to 6
2	Melt spinning equipment	7, 9, 10
3	Wet & Dry spinning Equipment	7, 8
4	Projection microscope	11
5	Gas burner	12
6	Chemical lab equipment's	13, 14

Suggested Project List:

a) **Natural fibers**: Collect various samples of natural fibers, study the Physical & chemical properties of Textile fibers and prepare comparative report. (**Duration: 8-10 hours**)
b) **Manmade fibre:** Collect various samples of manmade fibres, prepare line diagram of manufacturing stages with relevant details of production of manmade fibre.
c) **Melt, Wet and Dry spinning:** Prepare a compiled report of Melt, Wet and Dry spinning technology with machine process parameters.
d) **Fibre identification:** Identify the unknown textile fibre using various methods and prepare a report of it.
e) **Fibre waste**: Compile a report of handling fibrous & intermediate waste with figures, tables and comparative charts and strategies used and suggested.

Suggested Activities for Students: If any

a) Prepare specification of different textile fibers.
b) Explore library/internet for production technologies being used for production of different fibers and make a report.
c) Visit to manmade fiber industry and preparing report with sketches.
d) Prepare line diagram of manufacturing stages for different textile fibers.
e) Undertake micro-projects in teams.
f) Give seminar on any relevant topic.

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