

**GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**

**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**

I – Semester

Course Title: **Fiber Science and Application**

(Course Code: C4315103)

Diploma programme in which this course is offered	Semester in which offered
Computer Aided Costume Design and Dress Making	First

**1. RATIONALE**

Rapid changes and progress in the textile industry have led to the advancement in the fabrics selected for manufacturing garments. Manufacturing of fiber and textiles for apparel, household, and industrial use has a great business opportunity. This course on Fiber Science provides in-depth knowledge on different fibers and yarns available in the market, their manufacturing processes and their properties. This course will provide a sound foundation for students undertaking the course in costume designing and dressmaking.

**2. COMPETENCY**

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Select suitable textile fibers and yarn for given application based on its properties and manufacturing processes.**

**3. COURSE OUTCOMES (COs)**

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the following Course Outcomes (COs) achievement :

- Select suitable type of textile fiber based on its properties for given application
- Explain properties, manufacturing process and uses of natural and man-made fibers.
- Suggest suitable yarn for given application.
- Explain yarn spinning processes and techniques

**4. TEACHING AND EXAMINATION SCHEME**

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	CA	ESE	CA	ESE	
3	0	0	3	30*	70	-	-	100

(\*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, CA - Continuous Assessment; ESE -End Semester Examination.

## 5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. *Some of the PrOs marked “\*” are compulsory, as they are crucial for that particular CO at the ‘Precision Level’ of Dave’s Taxonomy related to ‘Psychomotor Domain’.*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Not Applicable		

## 6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Not Applicable	

## 7. AFFECTIVE DOMAIN OUTCOMES

The following **sample** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this course competency.

- a) Work as a leader/a team member.
- b) Follow ethical practices.
- c) Practice environmental friendly methods and processes. (Environment related)

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl’s ‘Affective Domain Taxonomy’ should gradually increase as planned below:

- i. ‘Valuing Level’ in 1<sup>st</sup> year
- ii. ‘Organization Level’ in 2<sup>nd</sup> year.
- iii. ‘Characterization Level’ in 3<sup>rd</sup> year.

## 8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom’s taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different level)	Topics and Sub-topics
<b>Unit – I</b>  <b>Basics of Fiber and its properties</b>	1a. Define Textile fiber. 1b. Classify Textile fibers. 1c. Describe primary properties of fiber. 1d. Describe secondary properties of fiber.	1.1 Definition of Textile fiber. 1.2 Classification of Textile fibers 1.2.1 Length wise 1.2.2 Origin wise 1.3 Primary properties of textile fibers: 1.3.1 Length 1.3.2 Strength

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different level)	Topics and Sub-topics
		1.3.3 Fiber diameter 1.3.4 Flexibility 1.3.5 Cohesiveness & Spinnability Uniformity 1.4 Secondary properties of textile fibers: 1.4.1 Density 1.4.2 Physical shape 1.4.3 Colour 1.4.4 Lustre 1.4.5 Moisture regain 1.4.6 Absorbency 1.4.7 Elasticity, Elongation and Elastic recovery 1.4.8 Resiliency and Compressibility 1.4.9 Dyeability 1.4.10 Static electricity 1.4.11 Pilling 1.4.12 crimp 1.4.13 Wicking- Hydrophilic fiber, Hydrophobic fiber
<b>Unit– II</b>  <b>Manufacturing processes and properties of Natural Fibers</b>	2a. Explain the properties of given natural fibers 2b. Suggest natural fibers for given applications 2c. Explain the manufacturing process of different Natural fiber 2d. Select natural fiber for its suitable application/use.	2.1 Introduction about Natural fibers- microscopic appearance, manufacturing process, properties and uses 2.1.1 Cotton 2.1.2 Silk 2.1.3 Wool 2.1.4 Linen 2.2 Brief Introduction and uses of other natural fibers- Jute, Flex, Banana, Bamboo, Coir etc.
<b>Unit– III</b>  <b>Manufacturing process and properties of Man-made Fibers</b>	3a. Identify Man-made fibers on basis of microscopic appearance 3b. Describe the properties of different Man-made fibers. 3c. Suggest the uses of different man-made fibers 3d. Explain the manufacturing process of different Man-made fibers 3e. Select Man-made fiber for	3.1 Introduction about Man-made fibers- microscopic appearance, manufacturing process, properties and uses 3.1.1 Polyester 3.1.2 Acrylic 3.1.3 Nylon 3.1.4 Viscose 3.2 Brief Introduction of other Man-made fibers - Glass, Acetate, Elastane, Spandex, Polypropylene

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different level)	Topics and Sub-topics
	given application	
<b>Unit– IV</b>  <b>Basics of Yarn</b>	4a. Define Yarn 4b. Classify different textile yarns 4c. Identify the given yarn 4d. Suggest yarn suitable for given application	4.1 Definition of yarn. 4.2 Types of Yarns: 4.2.1 Spun yarn, 4.2.2 Filament yarn 4.3 Classification of yarn and its application. 4.3.1 Simple Yarn: 4.3.1.1 Single yarn 4.3.1.2 Ply yarn 4.3.1.3 Cord yarn 4.3.2 Complex / Novelty Yarn: 4.3.2.1 Slub yarn 4.3.2.2 Spiral yarn 4.3.2.3 Flake yarn 4.3.2.4 Ratine yarn 4.3.2.5 Boucle, Loop or Curl yarn 4.3.2.6 Knot, Spot or Knob yarn 4.3.2.7 Chenille yarn
<b>Unit– V</b>  <b>Yarn Spinning</b>	5a. Define spinning 5b. Explain different yarn spinning processes 5c. Explain different yarn spinning techniques. 5d. Suggest spinning techniques for a given yarn	5.1 Definition of spinning. 5.2 Yarn spinning process 5.2.1 Opening and picking 5.2.2 Carding 5.2.3 Combing 5.2.4 Drawing 5.2.5 Roving 5.2.6 Spinning 5.3 Spinning techniques for Spun yarn 5.3.1 Ring spinning 5.3.2 Open - end spinning 5.3.3 Air jet spinning 5.3.4 Self twist spinning 5.3.5 Twist less spinning 5.4 Spinning techniques for filament yarn 5.4.1 Wet spinning 5.4.2 Dry spinning 5.4.3 Melt spinning

## 9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A	Total Marks
I	Basics of Fiber and its properties	5	4	8	-	12
II	Manufacturing process, properties and use of natural Fibers	11	2	6	8	16
III	Manufacturing process, properties and uses of Man-made Fibers	11	2	6	8	16
IV	Basics of Yarn	5	2	3	5	10
V	Yarn Spinning	10	2	4	10	16
<b>Total</b>		<b>42</b>	<b>12</b>	<b>27</b>	<b>31</b>	<b>70</b>

**Legends:** R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)

**Note:** This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.

## 10. 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. They also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews.

- Internet-based assignments.
- Teacher guided self-learning activities
- Undertake micro-projects in teams
- Undertake a market survey of different yarns.

## 11. 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:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- Guide student(s) in undertaking micro-projects.
- 'L' in **section No. 4** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
- About **20% of the topics/sub-topics** which are relatively simpler or descriptive in nature is to be given to the students for **self-learning**, but to be assessed using different assessment methods.
- With respect to **section No.10**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Guide students on how to address issues on environ and sustainability

- g) Make students understand the relevant topic using animation, video and presentations.

## 12. 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 the first four semesters, the micro-project are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the microproject should be about **14-16 (fourteen to sixteen) student engagement hours** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

- Collection and identification:** Collect different fibers or Yarns and identify each.
- Market survey:** Survey of different latest yarns.
- Yarn making:** Prepare different yarns from raw cotton manually.
- Field visit:** Find out any crop which is grown in nearby region for obtaining textile fibers.
- Chart making:** Prepare different charts showing Classification of fibers, manufacturing processes of fibers etc.
- Picture collection:** Prepare a chart or scrapbook showing photographs of various end uses of different nonconventional fibers like Jute, Coir, Flex etc.

## 13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Fabric Science	Arthur Price & Allen C. Cohen	Fairchild publication, New York. ISBN: 1-56367-004-6
2	Textiles: Fiber to Fabric	Bernard P. Corbman	MC Graw Hill, New York ISBN: 0-07-013137-6
3	Texbook of Clothing & Textiles	Dr. Sushma Gupta, Neeru Garg & Renu Saini	Kalyani Publisher, New Delhi ISBN: 81-7663-252-X
4	UGC- NET/SLET (Home Science)	Navneeta Kaur Sokhi	COSMOS book hive, (P) Ltd., Gurgaon-122016
5	Textile Science An explanation of fibre properties	E.P.G Gohl, L. D, Vilensky	CBS; 2 <sup>nd</sup> edition (1 January 2005) ISBN: 812391038X

**14. SOFTWARE/LEARNING WEBSITES**

- <https://www.commonobjective.co/article/quick-guide-to-different-types-of-textile-fibres>
- <https://www.coats.com/en/information-hub/Know-About-Textile-Fibres>
- <https://www.cottonworks.com/topics/sourcing-manufacturing/yarn-manufacturing/the-basics-of-yarn-manufacturing-spinning-process>

**15. PO-COMPETENCY-CO MAPPING**

Semester I	Fiber Science and Application (Course Code: C4315103)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
Competency	Select suitable textile fibers and yarn for given application based on its properties and manufacturing processes.						
CO a) Select suitable type of textile fiber based on its properties for given application	3	2	2	-	2	2	3
CO b) Explain properties, manufacturing process and uses of natural and manmade fibers.	3	2	2	2	2	2	3
CO c) Suggest suitable yarn for given application/situation	3	2	2	-	2	3	3
CO d) Explain yarn spinning processes and techniques	3	2	2	2	-	3	3

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.

**16. COURSE CURRICULUM DEVELOPMENT COMMITTEE****GTU Resource Persons**

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