GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester – I

Course Title: **Fundamentals of Yarn Technology**
(Course Code: 4315904)

Diploma programme in which this course is offered	Semester in which offered
Textile Design	First

1. RATIONALE

Textile engineering is the matter of dealing with the very delicate material like the fibre. Textile designer creates different designs and patterns on surface of the fabric. For different designs we need different fabric, and to produce the different types of fabric we need ~~a~~ different types of the yarn (Thread). So Textile designer should know the different technology, techniques as well as different material used for the yarn manufacturing. The final quality of the fabric depends on the quality of the yarn produced in spinning department. This subject is essential to provide the knowledge and practices for the yarn manufacturing technology. This subject is concerned with the carded as well combed yarn production in spinning. Textile designer can know which types of yarn is required for the production of the particular fabric types.

2. COMPETENCY

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

- **Use relevant technologies and machinery for producing specified type of yarn from suitable fibre.**

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 achievement of the following COs:

a) Assign relevant carding and combing spinning machine sequence.
b) Identify the functions of specified parts of common spinning machinery.
c) Examine the characteristics of the carded and combed yarn.
d) Relate the developments in yarn manufacturing technology to current trends .
e) Dispose fibrous & intermediate waste safely from textile mill.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
3	0	2	4	30*	70	25	25	150

(*): 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. *These PrOs need to be attained to achieve the COs.*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Prepare a write up about history of textile fibre.	I	02
2	Prepare a chart for the classification of textile fibre out of collected samples.	I	02
3	List the sequence of machinery for the carded yarn, combed yarn and conversion from fibre to garment.	II	02
4	Prepare a chart depicting construction and working of the Saw roller Ginning machine.	II	02
5	Prepare a chart depicting construction and working of Blow room opening and cleaning machinery.	III	02
6	Prepare a chart depicting construction and working of Blow room mixing machinery.	III	02
7	Prepare a chart depicting construction and working of Blow room Scutcher machine.	III	02
8	Prepare a chart depicting construction and working of Carding machine.	IV	02
9	Prepare a chart depicting construction and working of Draw frame machine.	IV	02
10	Prepare a chart depicting construction and working of speed frame machine.	IV	02
11	Prepare a chart depicting construction and working of sliver lap machine.	V	02
12	Prepare a chart depicting construction and working of comber machine.	V	02
13	Prepare a chart depicting construction and working of Ring frame machine.	V	02
14	Prepare a chart depicting construction and working of warp winding machine.	V	02
15	Prepare a chart depicting construction and working of weft winding machine.	V	02
	Minimum 14 Practical Exercises		**28**

Note

i. More ***Practical Exercises*** *can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

*ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course, which are embedded in the COs and ultimately the competency.*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Draw neat labelled sketches for the given machine.	20
2	Describe function of each parts of machine	20
3	Follow safe practices and measures during practical	10
4	Relate the actual machine part to chart	30
5	Interpret the result and conclude	20
Total		**100**

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 practical's in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Fibre chart for natural and synthetic, and sequence of machine for different manufacturing processes.	1,2,3
2	Saw roller Ginning machine.	4
3	Blow room machinery	5,6,7
4	Carding and draw frame machine	8,9
5	Sliver lap and comber machine	11,12
6	Speed frame and Ring frame machine	10,13
7	Warp winding and weft winding machine	14,15
8	Weighing scale (grams)	4,5,6,7,8,9, 10,11,12,13

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 fulfil the development of this course competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Motivate team members for better output.
d) 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 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd 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 levels)	Topics and Sub-topics
Unit – I **Introduction to Cotton Fibre and Textile Fibre**	1a. Describe Brief history of natural textile fibre 1b. Describe Brief history of manmade fibre 1c. Classify the Textile fibres 1d. Identify New fibre for textile	1.1 Definitions and history of Textile & Fibre 1.2 Types of textile fibres 1.3 Applications / Uses of textiles in various fields 1.4 Classification of textile fibres based on their origin.
Unit – II **Machine for various yarn production**	2a. Describe in brief cotton farming and production 2b. Provide basic information about world cotton farming and production 2c. Sequence for spun yarn production 2d. Describe Construction and working for the Saw roller Ginning machine	2.1. Sequence for the carded yarn production. 2.2. Sequence for the combed yarn production. 2.3. Sequence of the machine for conversion from fibre to garment. 2.4. Objects of the saw roller ginning machine 2.5. Function of the various parts of the ginning machine.
Unit– III **Blow room (Cotton bale to lap preparation)**	3a. Describe Opening and cleaning machine of the Blow room. 3b. Describe the Mixing machine of the blow room. 3c. Describe Scutcher for the Blow room. 3d. Describe Chute feed system from blowroom to carding machine.	3.1 Opening and cleaning machine (a) Vertical opener (b) Striker cleaner (c) Step cleaner (d) Axiflow cleaner (e) Two and three bladed beater (f) Porcupine beater (g) Krishner beater 3.2 Mixing machine (a) Hopper bale opener (HBO) (b) Bale plucker (c) Mixing bale opener (MBO) (d) Auto mixer (e) Multi mixer (f) Hopper feeder 3.3 Construction and working of the Scutcher machine.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit– IV **Card to speed frame (Lap to row)**	4a. Describe Construction and working of the carding machine. 4b. Describe Construction and working of the Draw frame machine. 4c. Describe Construction and working of the Speed frame machine. 4d. Describe Efficiency and production for the each machine.	4.1 Construction, working and function of the important parts of the carding machine. 4.2 Construction, working and function of the important parts of the Draw frame machine. 4.3 Construction, working and important parts of the speed frame machine.
Unit– V **Sliver lap to Winding machine (Sliver to yarn package)**	5a. Describe Construction and working of the Sliver lap machine. 5b. Describe Construction and working of the Comber machine. 5c. Describe Construction and working of the Ring frame. 5d. Describe Construction and working of the Warp winding. 5e. Describe Construction and working of the Weft winding.	5.1 Construction, working and important parts of the Sliver lap machine. 5.2 Construction, working and important parts of the Comber machine. 5.3 Construction, working and important parts of the Ring frame machine. 5.4 Construction, working and important parts of the Warp winding machine. 5.5 Construction working and important parts of the weft winding machine.
Unit– VI **Handling fibre and yarn waste**	6a. Justify the need of understanding fibrous & Yarn waste. 6b. Establish the relationship of sustainability and fibreas well as yarn waste. 6c. Suggest methods of handling fibre and yarn waste with examples. 6d. Suggest methods to dispose fibrous yarn waste.	6.1 Concept of fibrous & yarn waste 6.2 Sustainability and fibreas as well as yarn waste 6.3 Methods to handle fibre and yarn waste 6.4 Disposal of fibrous and yarn waste

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Cotton Fibre and Textile Fibre	02	2	4	4	10
II	Machine for various yarn production	06	3	3	4	10
III	Blow room (Cotton bale to lap preparation)	12	4	6	5	15
IV	Card to speed frame (Lap to row)	10	4	6	5	15
V	Sliver lap to Winding machine (Sliver to yarn package)	10	4	6	5	15
VI	Handling fibre and yarn waste	02	1	2	2	5
Total		**42**	**18**	**27**	**25**	**70**

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 perform following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

a) Collect the natural and manmade fibre and prepare chart.
b) Visit the cotton farm, sheep farm, and sericulture farm for understand the origin of the fibre.
c) Visit to cotton spinning mill and prepare the report for the same.
d) Draw neat sketches for each machinery of the spinning mill.
e) Arrange Seminar on given topic.
f) Discussion on technical aspects of the given topic.

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:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4*** means different types of teaching methods that are to be employed by teachers to develop the outcomes.

d) 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.

e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

f) Guide students on how to address issues on environment and sustainability

g) Guide students for using data manuals.

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:

a) **Introduction to Cotton Fibre and Textile Fibre:** Collect various samples of natural fibers and prepare the chart.

b) **Machine for various yarn production :** Write sequence of machinery for the production of carded and combed yarn. Draw neat sketch for the Ginning machine.

c) **Blow room (Cotton bale to lap preparation):** Make a small working machine model for the blow room machinery. Calculate the production and efficiency for the machine.

d) **Card to speed frame (Lap to row):** Make a small working machine model for the Drafting system.

e) **Sliver lap to Winding machine (Sliver to yarn package):** Collect the various sample from the mill from sliver the yarn and make the calculation sheet for the same.

f) **Handling fibre and yarn waste**: Compile a report of handling fibrous & yarn waste with figures, and strategies to used and suggested.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Handbook on cotton spinning industry	B.Purushothama	Publisher : WPI Publishing ; 1st edition (14 August 2015) ISBN-10 : 9385059017 ISBN-13 : 978-9385059018
2	Begginer's guide to	Hetty M wickers	Publisher : Butterworth &

S. No.	Title of Book	Author	Publication with place, year and ISBN
	Spinning		co(Publishers) ltd, 1982 ISBN : 0-408-00573-4
3	A practical guide to Blow room and Carding : Vol 2 (Manual of textile technology)	Werner Klein	Publisher : Manchester : Textile institute 1999 ISBN-10 : 1870812999 ISBN-13 : 978-1870812999
4	A practical guide to Ring spinning	Werner Klein	Publisher : Manchester : Textile institute 1987, (Short staple spinning) (January 1, 1987) ISBN-10 : 0900739940 ISBN-13 : 978-0900739941
5	The technology of short staple	Werner Klein	Publisher : Manchester : Textile institute 1998 ISBN-10 : 18708129880 ISBN-13 : 978-18708129880
6	A handbook to cotton spinning	J E Holme, Christopher Parkinson	Publisher : Wentworth Press (26 August 2016) ISBN-10 : 1362687510 ISBN-13 : 978-1362687511

14. SOFTWARE/LEARNING WEBSITES

- 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/

15. PO-COMPETENCY-CO MAPPING

Semester I	Fundamentals of Yarn Technology (Course Code: 4315904)								
	POs and PSOs								
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ development of solutions	PO 4 Engineering Tools, Experimen-tation &Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning	* PSO 1	# PSO 2
Competency	**Use relevant technologies and machinery for producing specified type of yarn from suitable fibre**								
Course Outcomes CO a) Assign relevant carding and combing spinning machine sequence.	3	3	2	3	2	2	2	1	3
CO b) Identify the functions of specified parts of common spinning machinery.	3	3	2	3	2	2	2	1	3
CO c) Examine the characteristics of the carded and combed yarn.	3	3	2	3	2	2	2	1	3
CO d) Relate the developments in yarn manufacturing technology to current trends.	3	3	2	3	2	2	2	1	3
CO e) Dispose fibrous & intermediate waste safely from textile mill.	2	2	2	-	2	-	2	1	3

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

*** PSO 1** Ability to apply knowledge of textile design in identifying and providing appropriate solutions to the problems of Textiles & Fashion designing industry.

 # PSO 2 Ability to design and develop optimized textile process as per the need of global demand.

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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