GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

CourseTitle: **Fundamentals of Textile**
(Course Code: 4312901)

Diploma programme in which this course is offered	Semester in which offered
Textile Manufacturing Technology	First

1. RATIONALE

The textile engineer has to work with different forms and processes of textile material with sound knowledge of fineness of particular material. In this emerging era of technology, there are multiple ways evolved to produce textile products according to the demand of society. To fulfill this demand, student must have the fundamental knowledge of all these process sequences, material identification, fabric weave structure and basic calculation regarding fineness to set basic machine parameters. Therefore, this course will enable student to use/apply basic principles of textile processes by giving overview of all conventional textile processes along with modern processes.

2. COMPETENCY

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

- **Apply basic principles of textile manufacturing processes in textile manufacturing.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

a) Select different forms of textile material for the given machine.
b) Select the different processes of yarn manufacturing.
c) Calculate the fineness of given yarn.
d) Select the different processes of fabric manufacturing.
e) Select the different types of eco fibre for textile manufacturing.

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	
2	-	2	3	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 the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

***Legends:** **L**- Class Room Instructions; **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	Select different types of packages of Spinning and weaving processes.	I	02
2	Perform hand ginning of given cotton sample.	II	02
3	Demonstrate the Blow room process.	II	04
4	Demonstrate the passage of material through Carding.	II	02
5	Demonstrate the passage of material through Draw frame.	II	02
6	Demonstrate the passage of material through Speed frame.	II	02
7	Demonstrate the passage of material through Ring frame.	II	02
8	Calculate the fineness of given yarn using different count system.	III	02
9	Demonstrate the passage of material through Winding machine.	IV	02
10	Demonstrate the passage of material through Warping machine.	IV	02
11	Demonstrate the passage of material through Multi cylinder sizing machine.	IV	02
12	Demonstrate the passage of material through Plain power loom.	IV	02
13	Select the different type of eco fibre	V	02
	Total		**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 required which are embedded in the COs and ultimately the competency..*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Operate the equipment setup e.g. Start machine with suitable input material	20
2	Follow safe practices measures	10
3	Record observations correctly e.g. Observe the passage of material and processes performed by machine	20
4	Interpret the result and conclude e.g. Identify the delivered material and conclusion of the process	20
5	Finely prepared document/report along with highlighting important information	30
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS AND SOFTWARE REQUIRED

These major equipment/instruments and Software required to develop PrOs are given below with broad specifications to facilitate procurement of them by the administrators/management of the institutes. This will ensure conduction of practical in all institutions across the state in proper way so that the desired skills are developed in students.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Cotton Ginning machine Saw ginning machine, Driving Pulley -Double groove for V-belts, Power Required 5. H.P. , Production Capacity Approx. 640 to 720 Kg Lint for 8 Hrs., Auto feeder	2
2	Carding machine; working width-1000-1020 mm, taker-in dia:250-350 mm, RPM:500-1300, No. of flats:100-112	4
3	Draw frame machine ; Doubling: up to 12, Main motor: 3.90 kW, Single delivery	5
4	Speed frame machine; No. of spindles: 120, Spindle speed: 1500 rpm, Semi-automatic doffing, Bobbin size 6 inch	6
5	Ring frame machine; No of spindles: 200, TPI: 4 to 55, Gage: 70mm, Count: 5 to 100 Ne	7

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) Follow safety precautions.
d) Practice environment 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 of textile**	1a. Define basic textile terminologies. 1b. Draw flow chart of textile manufacturing process	1.1 Meaning of textile terminologies. 1.2 Flow chart of yarn manufacturing process. 1.3 Flow chart of woven fabric manufacturing process
Unit – II **Yarn manufac-turing processes**	2a. Explain the working principle of cotton ginning machines. 2b. State the objects of spinning processes 2c. Demonstrate the passage of material through spinning machines	2.1. Introduction of Cotton Ginning process 2.2. Working principle of Ginning machine- McCarthy gin, Knife roller gin, Saw gin 2.3. Objects and passage of material through following machines: (i) Modern Blow room Line (ii) Card (iii) Draw frame (iv) Lap former (v) Comber (vi) Speed frame (vii) Ring frame
Unit-III **Yarn Numbering System**	3a. Determine different Yarn count systems 3b. Calculate yarn count from given data	3.1 Different types of Yarn numbering system 3.2 Yarn numbering system (i) Indirect count: English, Metric, Woolen, Worsted (ii) Direct count: Tex, Denier 3.3 Yarn count and its conversion
Unit– IV **Fabric manufac-turing processes**	4a. Describe the objects of Weaving Preparatory &Weaving process 4b. Demonstrate the passage of Material through Weaving Preparatory & Weaving Machine.	4.1 Objects of Weaving Preparatory & Weaving process. 4.2 Passage of material through following machines with neat sketch: (i) Winding machine (ii) Warping machine A. Direct warping B. Sectional warping C. Ball warping (iii) Multi cylinder sizing machine (iv) Plain Power loom

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit– V **Scope of eco fibres**	5a. Justify the need of eco fibres	5.1 Introduction of eco fibres 5.2 Characteristics of eco fibres and its importance 5.3 Classification of eco fibres

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction of Textile	03	5	6	0	11
II	Yarn manufacturing processes	09	4	10	6	20
III	Yarn numbering system	04	2	2	8	12
IV	Fabric manufacturing processes	09	4	10	6	20
V	Scope of eco fibres	03	4	3	0	7
Total		28	**19**	**31**	**20**	**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) Visit of spinning and weaving industries and prepare detail report of visit
b) List out different manufacturers of spinning machines.
c) List out different manufacturers of weaving machines.
d) Prepare the cost chart of different types of fibre per kg with sample.
e) Prepare survey report of different textile segments.
f) Prepare sample book of "eco fibres"

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 assessing 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 using the knowledge of this course

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-projects 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 should relate highly with competency of the course and the COs. Similar micro-projects could be added by the concerned course teacher:

a) **Ginning**: Prepare the report of different Ginning machine with their specifications, material and processes.
b) **Yarn preparatory**: Prepare the report of different yarn preparatory machines with their specifications, material and processes.
c) **Weaving preparatory:** Prepare the report of different weaving preparatory machines with their specifications, material and processes.
d) **Weaving:** Prepare the report of different weaving machines with their specifications, material and processes.
e) **Sample book:** Prepare a sample book of different forms of textile materials and eco fibres from market.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Volume-1-Technology of Short Staple Spinning	Werner Klein	Rieter Machine Works Ltd. Winterthur, 2014 ISBN 10 3-9523173-1-4/ISBN 13 938-3-9523173-1-0
2	Fibre to fabric	Bernard P. Corbman	McGraw-Hill Education – Europe, 1983 ISBN: 978-007-0662-360

S. No.	Title of Book	Author	Publication with place, year and ISBN
3	Weaving Machine, mechanism and management	Dr M. K. Talukdar, Prof. P. K. Shriramulu, Prof. D. B. Ajgaonkar	Mahajan publishers Pvt. Ltd. Ahmedabad, 1998 ISBN 81-85401-16-0
4	Weaving-Conversion of yarn to fabric	P.R.Lord and M.H.Mohamed	Merrow Publishing Co. Ltd., England, 1982 ISBN: 0 900 54178 4
5	Textiles and Environment	Dr. N.N.Mahapatra	Woodhead publishing India Pvt Ltd. New Delhi, 2015 ISBN: 978-93-80308-56-2
6	Textile Spinning, Weaving and Designing	M.G.Mahadevan	Abhishek Publications, Chandigarh ISBN:978-81-8247-107-8

14. SUGGESTED LEARNING WEBSITES

a) https://www.rieter.com/
b) https://www.textileschool.com/
c) https://www.fibre2fashion.com/
d) https://textileguide.chemsec.org/
e) https://www.textileassociationindia.org
f) https://www.nitma.com/
g) https://www.sitra.org.in/
h) https://www.itamma.org/
i) https://www.ecologicaltextiles.nl/
j) https://www.textileschool.com/154/eco-friendly-fibers/

15. PO-COMPETENCY-CO MAPPING

Semester I	Fundamentals of Textile (Course Code: 4312901)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ develop-ment 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
Competency **Apply basic principles of textile manufacturing processes in textile manufacturing.**	3	1	2	1	2	2	3
Course Outcomes **CO1**- Select different forms of textile material for the given machine.	3	1	-	-	1	1	3
CO2- Select the different processes of yarn manufacturing.	3	1	1	1	2	2	3
CO3- Calculate the fineness of given yarn	3	2	1	1	-	2	3
CO4- Select the different processes of fabric manufacturing	3	1	1	1	2	2	3
CO5- Select the different types of eco fibre for textile Manufacturing	2	-	3	-	3	1	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

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