GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Course Title: Processing of Denims & Garments
(Course Code: 4332805)

Diploma program in which this course is offered	Semester in which offered
Textile Processing Technology	Third

1. RATIONALE

The polytechnic graduates are required to supervise processing operations of denims & garments in the industry. They should have basic knowledge and skills to handle different wet processes for denims & garments as per the production requirements. This course provides in depth knowledge about wet processing of denims & garments with chemistry andchemical technology involved in the application of various essential chemicals. The course also provides the clear concept about the physical & chemical behaviour of denims & garments and enables to conduct technological set up for various wet processes according to their characteristic & requirements.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency,

- **Use knowledge and skills to conduct processing of denims & garments and improving quality & sustainability.**

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) Identify denims & garments.
b) Conduct wet processing of Denims.
c) Conduct wet processing of Garments.
d) Use relevant machine for wet processing of denims & garments.
e) Conduct sustainable processing of denims & garments.

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	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 the 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

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Require
1			
2			

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

S. No.	Equipment Name with Broad Specifications	PrO. No.

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 competency.

a) Work as a leader/a team member.
b) Practice good housekeeping
c) Maintain tools and equipment.
d) Follow ethical practices.

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 higher level 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 Denim & Garment Processing**	1a Introduction to denim & garment. 1b Prepare processing sequences for denims & garments.	1.1 Basic & importance of Denim 1.2 Difference between Denim & Jeans 1.3 Processing sequences for Denim 1.4 Basic & importance of Garment 1.5 Processing sequences for Garment
Unit – II **Wet Processing of Denims**	2a Describe the concept of warping, dyeing, washing & finishing for denim production. 2b Explain technology of denim dyeing, washing & finishing. 2c Describe various dyeing defects with their remedies for denim dyeing. 2d Explain advantages & limitations for denim processing.	2.1 Warping process 2.1.1 Ball warping 2.1.2 Beam warping 2.2 Dyeing process 2.2.1 Importance of indigo dyes for denim dyeing 2.2.2 Concept of ring dyeing mechanism 2.2.3 Different parameters of dyeing process 2.2.4 Rope dyeing process 2.2.5 Sheet dyeing process 2.2.6 Concept of top & bottom dyeing 2.3 Conventional finishing process such as stone washing, sand blasting, Enzyme washing, Acid washing and Bleach wash. 2.4 Defects & remedies of denim processing 2.5 Advantages & limitations of denim processing
Unit – III **Wet Processing of Garments**	3a Describe the concept and mechanism of garment dyeing, printing & finishing. 3b Explain technology of garment dyeing & printing. 3c Describe defects with their remedies for garment dyeing & printing. 3d Explain advantages & limitations for garment processing.	3.1 Garment Dyeing 3.1.1 Dyeing mechanism 3.1.2 Difference between fabric dyeing & garment dyeing 3.1.3 Garment dyeing with different dyes & pigments 3.2 Garment Printing 3.2.1 Introduction 3.2.2 Different types of prints & inks for printing 3.2.3 Garment printing & fixation methods 3.3 Concept of Garment finishing 3.4 Defects & remedies of garment processing 3.5 Advantages & limitations of Garment processing

Unit – IV **Machineries for Denim & Garment processing**	4a Explain different machineries used for denim processing. 4b Explain different machineries used for garment dyeing. 4c Explain different machineries used for garment printing.	4.1 Denim processing machineries 4.1.1 Rope dyeing machine 4.1.2 Sheet dyeing machine 4.2 Garment processing machineries 4.2.1 Paddle dyeing machine 4.2.2 Rotary dyeing machine 4.2.3 Jet circulating dyeing machine 4.2.4 Front load & Top load washing machine 4.2.5 Garment dryer 4.2.6 Circular screen printing machine 4.2.7 Heat press printing machine
Unit– V **Sustainable Denim & Garment processing**	5a Explain requirements of sustainability in textile processing. 5b Describe different technologies used for sustainable denim processing. 5c Describe different technologies used for sustainable garment processing.	5.1 Concept of sustainable denim & garment processing 5.2 Ozone processing of denims & garments 5.3 Plasma processing of denims & garments 5.4 Laser processing of denim 5.5 Digital printing of garments

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 Denim & Garment Processing	04	04	04	02	10
II	Wet Processing of Denims	12	08	10	12	30
III	Wet Processing of Garments	10	04	04	05	13
IV	Machineries for Denim & Garment processing	10	04	04	02	10
V	Sustainable Denim & Garment processing	06	02	03	02	07
Total		**42**	**22**	**25**	**23**	**70**

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

Note*: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions 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 vary slightly 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, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Literature survey of wet processing of denims & garments.
- Collection and Study of various samples of denims & garments.
- Visit to denim & garment industries to study their processing technologies and prepare reports.
- Group discussion on recent innovation in denim & garment processing.
- Collection of data of processing of denims & garments and make power point presentation.
- Seminar/Quiz/Presentation on recent developments in denim & garment processing.

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) Encourage students to refer different websites for having a deeper understanding of the subject.
g) Assign unit wise assignment to group of 4 to 5 students.
h) Use of video, animations, to explain concepts, facts and application related to printing.

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 micro-project 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) **Data sheet:** Prepare a data sheet for various combinations of chemicals and their quantities required for various chemical processing of Denims & Garments.

b) **Dye sample collection:** Visit textile dyeing industries/market shops and collect at least 20 to 30 various dyed samples of Denims & Garments.

c) **Print sample collection:** Visit textile printing industries/market shops and collect at least 20 to 30 various printed samples of Denims & Garments.

d) **Finishing sample collection:** Visit textile finishing industries/market shops and collect at least 20 to 30 various finished samples of Denims & Garments.

e) **Dyeing machine:** Prepare a short video film of various dyeing machine by visiting industries, and also edit the video as per process sequence.

f) **Printing machine:** Prepare a short video film of various printing machine by visiting industries, and also edit the video as per process sequence.

g) **Finishing machine:** Prepare a short video film of various finishing machine by visiting industries, and also edit the video as per process sequence.

h) **Sustainable Denims & Garments Processing machines :** Compile a report related to scope of sustainable technology in processing of Denims & Garments.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Denim – A Fabric for all	Dr. M.S. Parmar Shree, S.S. Satsangi, Dr. Jai Prakash	Northern India Textile Research Association, Ghaziabad
2	Denim- Manufacture, Finishing & Applications	Roshan Paul	Woodhead Publishing is an imprint of Elsevier, Cambridge, UK ISBN 9780857098436
3	Sustainability in Denim	Subramanian S. Muthu	Woodhead Publishing is an imprint of Elsevier, Cambridge, UK ISBN: 9780081020432
4	Fundamentals and Practices in Colouration of Textiles	J. N. Chakraborty	Woodhead Publishing India Pvt Ltd., New Delhi, India ISBN-9788190800143
5	Garment Manufacturing Technology	Rajkishore Nayak & Rajiv Padhye	Woodhead Publishing is an imprint of Elsevier, Cambridge, UK ISBN: 9781782422327

S. No.	Title of Book	Author	Publication with place, year and ISBN
6	Garment Dyeing- Ready to wear fashion from the dyehouse (Vol-19)	P. W. Harrison	North Carolina State University ISBN-9781870812139
7	Technology of Printing (Vol-IV)	Dr. V. A. Shenai	Sevak Publication, Mumbai,1984

14. SOFTWARE/LEARNING WEBSITES

a) https://nptel.ac.in
b) www.youtube.com
c) www.fibre2fashinon.com
d) www.textilelearner.net
e) www.textiletutorials.com
f) www.textilefashionstudy.com

15. PO-COMPETENCY-CO MAPPING

Semester III	Processing of Denim and Garment – 4332805						
	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	Use knowledge and skills to conduct processing of denims & garments and improving quality & sustainability.						
Course Outcomes CO a) Introduction to Denim & Garment Processing	3	1	1	--	--	1	2
CO b) Wet Processing of Denims	3	3	2	2	--	2	2
CO c) Wet Processing of Garments	3	3	2	2	--	2	2
CO d) Machineries for Denim & Garment processing	3	1	1	3	--	1	2
CO e) Sustainable Denim & Garment processing	3	2	2	2	3	1	2

*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

S. No.	Name and Designation	Institute	Contact No.	Email
1)	Mr. R. M. Pandya Lecturer	Dr. S. & S. S. Ghandhy College of Engg. & Tech., Surat	9428409925	ridpandya@gmail.com
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