



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI03028031

Course / Subject Name : Processing of Denims & Garments

| | |
|--------------------------------|-----------------|
| w. e. f. Academic Year: | 2024-25 |
| Semester: | 3 rd |
| Category of the Course: | PCC |

| | |
|----------------------|--|
| Prerequisite: | A foundational understanding of wet processing techniques such as scouring, bleaching, and dyeing, along with familiarity in safe chemical handling and laboratory practices of dyeing, is essential to grasp the advanced chemical and technological treatments used in denim and garment processing. Additionally, foundational concept of textile fibers, yarn and fabric manufacturing processes especially woven fabrics like denim as well as elementary concepts of textile chemistry and pretreatment processes. |
| 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 and chemical 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. |

Course Outcome:

After Completion of the Course, Student will able to:

| No | Course Outcomes | RBT Level |
|----|---|-----------|
| 01 | Identify denims & garments. | R + A |
| 02 | Conduct wet processing of Denims. | R+ U + A |
| 03 | Conduct wet processing of Garments. | R + U + A |
| 04 | Use relevant machine for wet processing of denims & garments. | R + U + A |
| 05 | Conduct sustainable processing of denims & garments. | R + U + A |

*Revised Bloom's Taxonomy (RBT)



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Teaching and Examination Scheme:

| Teaching Scheme (in Hours) | | | Total Credits L+T+ (PR/2) | Assessment Pattern and Marks | | | | Total Marks |
|-------------------------------|---|----|------------------------------------|------------------------------|--------|----------------------|---------|----------------|
| L | T | PR | C | Theory | | Tutorial / Practical | | |
| | | | | ESE (E) | PA (M) | PA(I) | ESE (V) | |
| 3 | 0 | 2 | 4 | 70 | 30 | 20 | 30 | 150 |

Course Content:

| Unit No. | Content | No. of Hours | % of Weightage |
|-------------|--|-----------------|-------------------|
| 1. | <u>Introduction to Denim & Garment Processing</u> 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 | 08 | 15 |
| 2. | <u>Wet Processing of Denims</u> 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 | 12 | 30 |



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| | | | |
|--------------|--|-----------|------------|
| 3. | <u>Wet Processing of Garments</u> 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 | 10 | 25 |
| 4. | <u>Machineries for Denim & Garment processing</u> 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 and Hydro-extractors 4.2.6 Circular screen printing machine 4.2.7 Heat press printing machine | 08 | 15 |
| 5. | <u>Innovation and new Technologies</u> 5.1 Concept of sustainable denim & garment processing: Green chemicals and bio-based auxiliaries 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 5.6 Machines used for special effects: Sandblasting, laser machines, scraping tools 5.7 Digital denim finishing, biodegradable finishes, AI in fashion processing | 07 | 15 |
| Total | | 45 | 100 |



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Suggested Specification Table with Marks (Theory):

| Distribution of Theory Marks (in %) | | | | | |
|-------------------------------------|---------|---------|---------|---------|---------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 30 | 35 | 35 | 0 | 0 | 0 |

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 | 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 |
| 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 |



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(b) Open source software and website:

1. www.nptel.iitm.ac.in
2. <https://ndl.iitkgp.ac.in>
3. www.textileschool.com
4. www.textileassociationindia.org
5. www.textilelearner.blogspot.com
6. www.textileapex.blogspot.com

Suggested Course Practical List:

| Sr. No. | Practical Outcomes (PrOs) | Unit No. | Approx. Hrs. required |
|-------------|--|----------|-----------------------|
| 1 | Identify and differentiate various types of denim fabrics based on physical appearance and hand feel | I | 02 |
| 2 | Desizing of Denim fabric | II | 02 |
| 3 | Scouring of Denim fabric | II | 02 |
| 4 | Bleaching process of denim fabric | II | 02 |
| 5 | Dyeing of Fabric by indigo rope dyeing method | III | 04 |
| 6 | Dyeing of Fabric by indigo sheet dyeing method | III | 04 |
| 7 | Develop and compare top and bottom dyeing effects on denim fabric | III | 02 |
| 8 | Finishing of Denim fabric giving stone wash effect using pumice stone | III | 02 |
| 9 | Finishing of Denim fabric by enzyme wash method | IV | 02 |
| 10 | Dyeing of garment with using self-shade | IV | 02 |
| 11 | Dyeing of garment dyeing using combination shade | IV | 02 |
| 12 | Printing of Garments with pigments. | V | 02 |
| 13 | Identify common defects in processed denim and garments | V | 02 |
| Total Hours | | | 30 |

List of Laboratory/Learning Resources Required:

| Sr. No. | Equipment Name with Broad Specifications | PrO. No. |
|---------|---|----------|
| 1 | Dye Pots: 250 ml, 500 ml | All |
| 2 | Glass rod | All |
| 3 | Beaker: 100 ml, 250 ml, 500 ml | All |
| 4 | Measuring Cylinder of capacity 10 ml, 25 ml, 100 ml | All |



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|----|---|-----|
| 5 | Water Heating Bath | All |
| 9 | Laboratory Stirrer: 300 to 500 rpm | All |
| 10 | Laboratory Oven: 150°C | 8,9 |
| 12 | Laboratory Padding Mangle: Horizontal | All |
| 13 | Digital weighing balance: 0.02 gm accuracy (100 gm) | All |
| 14 | Laboratory Printing Table | 12 |
| 15 | Laboratory Stirrer: 300 to 500 rpm | 12 |
| 16 | Laboratory Pressure Steamer: 30 psi and 150°C | 12 |

Suggested Project List:

- 1) Data sheet: Prepare a data sheet for various combinations of chemicals and their quantities required for various chemical processing of Denims & Garments.
- 2) Dye sample collection: Visit textile dyeing industries/market shops and collect at least 20 to 30 various dyed samples of Denims & Garments.
- 3) Print sample collection: Visit textile printing industries/market shops and collect at least 20 to 30 various printed samples of Denims & Garments.
- 4) Finishing sample collection: Visit textile finishing industries/market shops and collect at least 20 to 30 various finished samples of Denims & Garments.
- 5) Dyeing machine: Prepare a short video film of various dyeing machine by visiting industries, and also edit the video as per process sequence.
- 6) Printing machine: Prepare a short video film of various printing machine by visiting industries, and also edit the video as per process sequence.
- 7) Finishing machine: Prepare a short video film of various finishing machine by visiting industries, and also edit the video as per process sequence.
- 8) Innovative Denims & Garments Processing machines: Compile a report related to scope of Innovative technology in processing of Denims & Garments.



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Suggested Activities for Students:

1. **Survey the market** for garment washing chemicals (e.g., enzymes, softeners, bleach) and compare their functions, cost, and eco-friendliness.
2. **Prepare a comparative table** of common denim wash types (stone wash, enzyme wash, acid wash, rinse wash) with process steps and effects.
3. **Collect and display images or fabric samples** showing various denim effects like whiskering, laser fading, and 3D crinkling with their method of creation.
4. **Prepare a list of machines** used in denim and garment processing with their purpose and process stage (e.g., washing, drying, finishing).
5. **Gather information on innovative techniques** such as ozone wash, e-flow, and laser finishing, highlighting benefits over traditional methods.

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