GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Textile Manufacturing Technology

Course / Subject Code : DI02C29011(Only for C to D Students)

Course / Subject Name : Spinning Technology - II

w. e. f. Academic Year:	**2024-25**
Semester:	2nd
Category of the Course:	ESC

Prerequisite:	**Basic knowledge of fiber, ginning, blow room and carding process.**
Rationale:	Technological up gradation in yarn manufacturing has led to design improvement in spinning machines and better process control. This course is intended to impart knowledge of recent technological development in Draw frame & Comber. The Draw frame & Comber are important machineries of the spinning operation because it influences yarn quality. Quality of yarn is directly related to the quality of drawn and combed sliver. Draw frame improves the sliver quality through fibre parallelization and ensures uniform sliver formation. Combing improves the fibre length distribution curve of feedstock through removal of noil (short fibres), enabling spinning of uniform finer yarn. This course also provides knowledge of modern development in creel region, drafting system, incorporation of auto leveler and different machine elements ensuring better fibre control and minimizes fibre loss with improved sliver quality and maintaining machine efficiency.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Use Draw frame to produce uniform fault free sliver.	A
02	Select relevant machine/process for Combing preparatory to produce even lap sheet.	R, A
03	Use Comber to produce good quality of sliver by reducing and reusing fibre wastages.	A
04	Calculate the production of Draw frame, Lap former, and Comber.	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
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.Draw frame	1.1 Objectives of Draw frame. 1.2 Principles of drafting & doubling, Effects of drafting & doublingon yarn quality. 1.3 Sliver blending in Draw frame. 1.4 Passage of material & functions of important parts in Draw frame. 1.5 Creel in Draw frame. 1.6 Terminologies used in Drafting system- Actual draft, Mechanical draft, Break draft, Main draft, Drafting force. 1.7 Different types of drafting systems used on Draw frame. ▪ 3 over 3 roller drafting system with pressure bar ▪ 4 over 3 roller drafting system with pressure bar ▪ 5 over 4 roller drafting system with pressure bar 1.8 Different types of Top roller weighting Systems. ▪ Dead weight weighting system ▪ Top arm weighting system ▪ Magnetic weighting system 1.9 Electrical stop motion. 1.10 Routine maintenance in draw frame. 1.11 Technological design change in modern Draw frame. 1.12 Online monitoring and auto leveling. 1.13 Drawn sliver defects, their causes & remedies.	11	37%

2.Comber preparatory process	2.1 Requirements of the card with respect to Combing. ▪ Card sliver purity ▪ Card sliver evenness 2.2 Requirements of the draw frame with Respect to Combing. ▪ Pre-drawing (Breaker Draw frame)-combing preparation ▪ Post drawing (Finisher Draw frame) -combing process. 2.3 Requirement of the even passage between Card and Comber. 2.4 Preparation of stock for Combing. 2.5 Combing preparation Sliver doubling process. ▪ Detailed study of Super lap former.	6	20%
3.Comber	**Comber** 3.1 Objects of Combing, value of Combing. 3.2 Types of Combing. 3.3 Detail study of cycle of operation in Comber. 3.4 Brief study of following motion in Comber. ▪ Feeding, Nipping, Cylinder combing, Top comb combing, Detaching. 3.5 Noil Extraction Theory ▪ Noil elimination with counter (backward) feed ▪ Noil elimination with concurrent (forward) Feed 3.6 Parameters influencing the Combing Operation. ▪ Raw material (fibre length, uniformity, stiffness, fineness, impurities). ▪ Material preparation (fiber parallelization, batt thickness, batt evenness, orientation of hooks). ▪ Factors associated with machine (condition of comb, nips/min, operation of comb, sliver forming element, drafting arrangement). ▪ Machine settings (feed/nip, feed type, detachment setting, tooth density in comb, penetration of top comb, piecing). ▪ Ambient conditions (temperature, humidity). 3.7 Define the combing efficiency. 3.8 Waste extraction & its control-waste Setting. 3.9 Combed sliver defects, their causes &remedies. 3.10 Routine maintenance of Comber.	10	33%

	3.11 Significant developments in combing.		
4.Production calculation	4.1 Production calculation for Draw frame, Lap former &comber. 4.2 Calculate draft & production of Draw frame. 4.3 Calculate draft & production of Comber. 4.4 Calculate draft & production of Lap former.	3	10%
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**30**	**30**	**10**	**5**	**5**

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:

1. The Rieter Manual of Spinning, Volume-I-Technology of Short-staple spinning, W Klein, Rieter Machine Works Ltd., Winterthur, Switzerland, 2014, ISBN 10 3-9523173-1-4/ ISBN 13 978-3-9523173-1-0.
2. The Rieter Manual of Spinning, Volume-III Spinning preparation, W Klein, Rieter Machine Works Ltd., Winterthur, Switzerland, 2014, ISBN 10 3-9523173-3-3-0/ ISBN 13 978-3-9523173-3-4.
3. Fundamentals of Spun Yarn Technology,Carl Lawrence, CRC Press publication, Florida. ISBN 0-203—00958-4 Master E-book ,ISBN 1-56676-821-7 (Print Edition).
4. NCUTE ExtensionProgram- Drawing, Combing and Roving, Dr. R Chattopadhyay, Dr. R. S. Rengasany,NCUTE PilotProgram, Indian Institute of Technology, New Delhi, 2003.
5. Handbook of Yarn Production, Peter R. Lord, Handbook of Yarn Production.
6. Spun Yarn Technology, Oxtoby Eric, Butterworth's (Publishers) Limited, UK,1983, ISBN: 0-408-01464—4.

(b) Open source software and website:

a) http://nptel.ac.in/
b) http://www.textileassociationindia.org/
c) http://www.sitra.org.in/

d) http://www.itamma.org/
e) https://textilestudycenter.com/
f) http://www.textileschool.com/
h) https://textilestudycenter.com/textile-books-free-donwload/
i) http://www.cottonsjourney.com/Storyofcotton/page5.asp
j) http://textilelearner.blogspot.in/
k) http://www.rieter.com

Suggested Course Practical List:

1. Demonstrate the passage of material through Draw frame with a neat labelled sketch.
2. Determine the important drafting parameters in Draw frame.
3. Demonstrate the drafting elements in Draw frame.
4. Identify the different types of top roller weighting systems in Draw frame.
5. Draw labelled sketches of different drafting systems in Draw frame.
6. Observe the working of electrical stop motion on Draw frame and write its working principle.
7. Demonstrate working principle of auto leveler used for Draw frame with a labelled figure.
8. Demonstrate the passage of material through Super lap former with a neat labelled sketch.
9. Describe the passage of material through Comber with a neat labelled sketch.
10. Demonstrate Combing cycle with neat labelled sketches.
11. Demonstrate nipper motion on Comber.
12. Demonstrate detaching roller drive in Comber.
13. Demonstrate noil extraction with forward and backward feed in Comber.
14. Calculate the production of Draw frame and Comber from the provided data.

List of Laboratory/Learning Resources Required:

Sr.No.	Equipment Name:
1.	Miniature Draw frame
2.	Super lap former
3.	Comber

Suggested Project List:

a) **Sample collection:** Collect the sample of different feed and delivery material of Draw frame and comber and prepare a chart with machine specifications.
b) **Drawing quality and maintenance**: Draw line diagram of various auto leveler used in Draw frame (Sliver measuring device) and enlist merits and demerits of each system.

c) **Sliver analysis:** Analyze number of fibres in cross section, calculate hank of sliver and weight/unit length (Linear density).
d) **Sliver defects analysis:** Prepare a report on identification of various defects observed in Drawn or Combed slivers, provide reasons for those defects and suggest possible remedies to avoid them.
e) **Draw frame and comber settings:** Prepare a report on various essential changes in required in Draw frame and Comber and their settings while changing the raw material from natural fibre to man-made fibre.
f) **Machine specifications:** Prepare a report on machine specifications of Draw frame, Super lap former and Comber from different manufacturers with part numbers mentioned.

Suggested Activities for Students:

a) Prepare a report on Draw frame of different manufacturers based on your industrial visit.
b) Prepare a report on Comber of different manufacturers based on your industrial visit.
c) Collection of various machine specifications, and process parameters for Draw frame, Lap former, and comber from industries.(LMW, Rieter, Trutzschler)
d) Visit a nearby spinning unit, and prepare a report with suitable machinery sketches.
e) Prepare a presentation on recent technological advancement of Draw frame, Lap former and Comber.
f) Prepare a comparative report from e-brochures and manuals available from different machine manufacturers for Draw frame, Lap former and Comber.
g) Present a seminar PPT on any of the following relevant topic- Draw frame, Lap former and Comber.
h) Explore library/internet facilities for preparing report on Draw frame, Super lap former and Comber.
i) Internet based assignment topic wise.

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