



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: UG

Branch: Textile Engineering

Subject Code: BE04029021

Subject Name: Yarn Manufacturing Techniques - II

| | |
|-------------------------|--------------------------|
| w. e. f. Academic Year: | 2024-25 |
| Semester: | 4 |
| Category of the Course: | Professional Core Course |

| | |
|----------------------|---|
| Prerequisite: | Basic knowledge of fibres, ginning, blow room and carding process. |
| Rationale: | Short staple spinning is widely used in the textile industry for processing various cotton fibre types. Key preparatory steps—mixing, attenuation, parallelization, and linear density reduction—enable the production of different yarn counts. The two main processes, carded and combed spinning, serve specific purposes based on the desired yarn quality and end use. |

Course Outcome:

After Completion of the Course, Student will able to:

| No | Course Outcomes | RBT Level |
|----|--|-----------|
| 01 | Understand basics of Drawing, Combing and roving formation processes of staple spun yarns. | R,U |
| 02 | To understand the importance and function of every parts of the draw frame, comber and speed frame machine. | R, U, A |
| 03 | Apply knowledge of cotton spinning process for a given variety cotton fiber to manufacture different count range. | A, N, E |
| 04 | Implement the remedial measures for different quality related problems in sliver formation and roving formation processes. | A, E |
| 05 | Calculate the production and efficiency of Draw frame, comber and speed frame machine. | R, E |

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

| Teaching / Learning Scheme (in Hours per semester) | | | | | Total Credits | Assessment Pattern and Marks | | | | | Total Marks |
|---|---|----|-----------|--------------------------------------|------------------|------------------------------|----------------|----------------------|------------------|------------|----------------|
| L | T | P | TW/ SL | Total no of hours per semester | | Theory | | Tutorial / Practical | | | |
| | | | | | | ESE (E) | PA / CA (M) | PA/ CA (I) | TW/ SL (I) | ESE (V) | |
| 45 | 0 | 30 | 45 | 120 | 4 | 70 | 30 | 20 | 30 | 50 | 200 |



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Course Content:

| Unit No. | Content | No. of Hours | % of Weightage |
|----------|--|--------------|----------------|
| 1. | Draw Frame: Objectives; Design - Constructional features and working principles of draw frame, Creel section: Purpose and different arrangement of cans in creel, Drafting unit: Construction and working of roller drafting system, construction, characteristics, and maintenance of bottom and top rollers, selection of top and bottom roller diameter, top roller loading system, generation of drafting irregularity (Drafting wave), Steps to avoid mass irregularity in sliver. Construction and working of 3 over 3 roller drafting system, 4 over 4 roller drafting system, 3 over 4 roller drafting system, 4 over 3 roller drafting system, 5 over 4 roller drafting system, Delivery section: Web condensation, Trumpet, Package formation; Machine defect: Roller eccentricity and roller slip, Draw frame autoleveller: Types of autoleveller, Classification of autoleveller, use of autoleveller in draw frame, Latest developments in draw frame, Various defects in draw frame sliver its causes and remedies, Production calculation. | 16 | 35 |
| 2. | Comber: Comber Requirements of the Card, Draw frame etc. with respect to combing, Preparation for combing/Comber lap preparation: Conventional system and modern system, Introduction and objects of combing process; History of comber development; Types of Application; Types of Comber, Passage of Material through Combing machine; Sequence of operations in a Comber; Important elements of Combing – Feed Roller, Nipper Assembly, Combing cylinder, Top Comb etc, Piecing, Take up of Web, Coiling the sliver, Waste Removal etc.; Parameters influencing the combing operation; Temperature and Humidity in Combing; The influence of machine components and settings on combing; Influence of the feed stock on combing, The noil theory of Gegauff; Common defects and their causes during the Combing process; control of Comber waste; Modern Developments; Calculations - % of comber noil, comber production. | 16 | 35 |
| 3. | Speed Frame: Objectives, Construction and working principle of speed frame, Creel, can arrangement in creel, Spindle arrangement; Drafting unit: Elements of drafting unit- top and bottom roller, Aprons, Nose bar, cradle, Spacer and condenser. Top roller loading system; Twisting: Requirement of twist, amount of twist in roving, twist insertion, Construction, different types of flyers, function of flyer top | 13 | 30 |



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| and pressure arm; Roving bobbin geometry, Formation of roving bobbin, Winding of roving: spindle lead and bobbin lead; Bobbin building mechanism and its functions: To shift the belt on cone drums, To shorten the lift and to reverse the direction of traverse; Modern developments in speed frame, Production calculation. | | |
| Total | 45 | 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 | 20 | 20 | 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 Technology of Short Staple Spinning, A Practical Guide to Combing, Drawing and Roving frame, Volumes 1-3, W. Klein, The Textile Institute Manchester, U.K., 1998.
2. Fundamentals of Spun Yarn Technology, Carl A Lawrence, CRC Press publication, New York.
3. Handbook of Yarn Production, Technology, Science and Economics, P. R. Lord, CRC Press publication, New York, 2002.
4. Spinning, Drawing, Combing & Roving, R. Chattopadhyay and R. S. Rengasamy, NCUTE Pilot, Program, Indian Institute of Technology, New Delhi, 2003.
5. Advances in Technology of Yarn Production, R. Chattopadhyay, NCUTE, IIT Delhi, 2002.
6. Essential calculations of practical cotton spinning by T. K. Pattabhiraman.
7. Spinning of Man Made and Blends on Cotton System, Salhotra K R, The Textile Association of India, Mumbai, 1989.

(b) Open source software and website:

1. <https://nptel.ac.in>
2. World Wide Web, Google search engine, etc.

Suggested Course Practical List:

1. To study the passage of drawframe.
2. To study drive to different parts on draw frame.
3. Draw frame production calculation.
4. To study the passage of material on sliver lap former machine.



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5. To study the passage of material on ribbon lap former machine.
6. To study the passage of material on comber.
7. To study drive to different parts of comber machine.
8. To study combing cycle.
9. Study the important settings on comber and its gauges.
10. Comber production calculation.
11. To study the passage of material through speed frame.
12. To study drive to different parts of machine.
13. To study builder motion.
14. Calculation of draft, TPI, and Production calculation.

List of Laboratory/Learning Resources Required:

Spinning Laboratory: Draw frame, sliver lap, ribbon lap, lap former, comber and speed frame machine.

Suggested Project List:

- **List of Suggested Activities for Problem Based Learning:**

| Sl. No. | Name of the activity | No. of hours | Evaluation Criteria |
|---------|---|---|--|
| 1 | Industry/Research laboratory visit | Visit = 5h, Report preparation = 5h Total = 10h | Based on report submitted. Report should contain observations and calculations based on industry/ lab data |
| 2 | Assignment writing. Numerical based assignment is preferable. | 5 assignments of 2h each. Total = 10h | Based on the assignment submitted. |
| 3 | Self learning on-line course | Minimum duration of the course should be 10h. | Examination based assessment at the end of course. Based on the certificate produced. |
| 4 | Poster/chart/power point preparation on technical topics | Duration = 6 h | Based on poster/chart preparation and presentation skills |



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| 5 | Technical Video based learning related to the subject | Duration of video = 5h Report preparation = 5h Total = 10h | Report /presentation based on the video learning outcomes. |
| 6 | Working/non-working model on technical topics | Working = 12 h Non- working = 8 h | Based on inter department/external evaluation |
| 7 | Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/any other issue | Duration = 15 h for industrial exposure Problem identification and tentative solution = 10 h Total = 20 h | Based on evaluation of critical problems and solutions |
| 8 | Group Discussion on emerging/trending technical topics based on subject | Duration = 1 h each | Based on performance in group discussion, technical depth, knowledge etc. |
| 9 | Real world case studies-based learning | Duration of data collection/study = 5h Report preparation = 5h Total = 10h | Based on in-depth study, technical depth, data collected, fact finding, etc. |

- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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