GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3162908
Semester – VI
Subject Name: Modern Yarn Production Technology

Type of course: Professional Elective Course

Prerequisite: Basic knowledge of Yarn Manufacturing 1, 2 & 3.

Rationale: Various techniques used for manufacturing the yarn like Rotor, Friction, Air jet etc. Process and characteristics of yarn produced by using different spinning methods and its applications in various area.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Requirements of Alternative spinning processes other than ring spinning. Possibilities for using the various spinning processes, Basic principle of open end spinning.	2
2	**Rotor Spinning Technology –** Ring spinning limitations as compared to rotor system, Raw material requirement for rotor spinning. Mechanism of yarn formation in rotor spinning: Assembling of fibers, Integration of fibers into the yarn, Twist insertion. Rotor yarn structure: Fiber orientation and extent, Fiber migration, Twist structure, Packing of fibers in yarn. Various parameters influencing the yarn structure and quality: Opening roller wire profile and speed, Rotor speed, Rotor diameter, Rotor groove, Side wall angle, Draw off nozzle. Rotor yarn characteristics, Developments in rotor drives, Production of fine rotor yarns, manmade yarns and blends, speciality yarns etc, Limitations and problems in rotor spinning systems. Recent technological developments in spinning and processing of rotor spun yarns.	10
3	**Air Jet Spinning –** Working Principle of air jet spinning, Raw material preparation for air jet spinning, Principles of operation of MJS, MTS and MVS systems, Difference between air jet spun and vortex spun yarn structures, Process variables and machine parameters affecting the product quality, Yarn properties, limitations and some of the important applications.	7
4	**Friction Spinning –** Operating principle of friction spinning, Raw material requirement, Mechanism of yarn formation in friction spinning, Working principle of different friction spinning systems like DREF1, DREF2, DREF3, DREF5, DREF2000, DREF3000 along with technical	7

	descriptions, Yarn structure formation in friction spinning, Spinning performance and yarn quality in relation to various influencing parameters, Yarn properties, limitations and some of the important applications, Recent developments in friction spinning.	
5	**Other Unconventional Spinning Techniques –** Twist less spinning: TWILO Process and BOBTEX process method of yarn production, yarn characteristics and its application. Self-twist spinning: Operating principle, Yarn structure and its application. Wrap Spinning: Operating principle, Yarn structure and its application. Siro yarn spinning: Operating principle, Yarn structure and its application. Solospun yarn: Benefits of solospun technology and its Process. Core yarn spinning: Method of core yarn production and its application.	**10**
6	**Compact Spinning** – Introduction about compact yarn spinning, Comparison of yarn structure with that of ring spun yarn, Detailed study of compact yarns like ROCOS, Elite, COMFOR spinning etc. Advantages of condensed yarn spinning.	**4**
7	Recent developments in all these spinning systems.	**2**

Suggested Specification table with Marks (Theory): (For BE only)

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

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. R.V.Mahendra Gowda, New Spinning Systems, NCUTE Publication, IIT, New Delhi, 2003.
2. C.A. Lawrence, Advances in yarn spinning technology, Woodhead Publishing limited, 2010
3. Peter R. Lord, Handbook of Yarn production, Woodhead Publishing limited. 2000.
4. E. Dyson, Rotor Spinning: Technical and Economic Aspects, Textile Trade Press, 1975
5. Lawrence C A, Fundamentals of Spun Yarn Technology, 1st Ed;, CRC Press LLC, Florida,USA (2003).
6. The Rieter Manual of Spinning, Rotor Spinning, Volume 5.
7. The Rieter Manual of Spinning, Alternative Spinning System, Volume 6.
8. C.A. Lawrence, K. Z. Chen, Rotor Spinning. Textile Progress, Volume 13.
9. B.C.Goswami, J.G.Martindale, Textile Yarns, A Wiley-Interscience Publication, 1977
10. R.Nield, Open End spinning, Textile Institute, Manchester 1975.

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Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Describe the Rotor spinning principle, yarn Structure, properties and applications of rotor spun yarn.	25
CO-2	Compare the various spinning techniques for production of yarn.	25
CO-3	Express the fundamentals principle of spinning, drawing and twisting using for production of yarn by using various spinning technique.	30
CO-4	Calculate the production and efficiency of various yarn production machine.	10
CO-5	State the latest development in various new spinning techniques.	10

List of Experiments:

1. To study the passage of yarn through rotor spinning machine.
2. To study the yarn formation mechanism in rotor spinning machine.
3. To study the various parameters like opening roller wire profile and speed, Rotor speed, rotor diameter, rotor groove, side wall angle and draw off nozzle which are influencing the rotor yarn structure and characteristics.
4. Production calculation of rotor spinning.
5. To study the passage of yarn through MJS, MTS and MVS air jet spinning machine.
6. To study the working principle of air jet spinning system and the characteristics of yarn and its application.
7. To study the passage of yarn through DREF1, DREF2, DREF3, DREF5, DREF2000, DREF3000 Friction spinning machine.
8. To Study the working principle of all friction spinning machine and yarn characteristics and application of friction spun yarn.
9. Production of yarn by using twist less, self twist, wrap spinning, siro and solo spun yarn technique.
10. Use of the various types of spinning methods for the production of core spun yarn.
11. Working principle of the compact spinning system.
12. To study the basic properties of yarn produced by using the various spinning methods.
13. To study about the modern developments in various spinning techniques.

Major Equipment: Rotor spinning machine, Airjet spinning machine, Friction spinning machine, Twist less spinning machine.

List of Open Source Software/learning website: https://nptel.ac.in, World Wide Web, Google Search Engine etc.