SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Engineering

B E III Textile Technology: Semester –VI

Subject Name: Modern Spinning Technology **Subject Code: BTTT14602**

Type of course: Professional Elective Course II

Prerequisite (if any): Textile Material, Yarn Manufacturing

List of Courses where this course will be prerequisite: Process & Quality Control in Spinning & Weaving, Yarn Structure & Fabric Geometry, Textile Mill Management

Rationale: (should also include Description of the relevance of this course in the Program)
Subject covers various principles, mechanisms and technology involved for market dominant unconventional yarn formation processes (Open-end Rotor Spinning, Friction spinning and Air-jet Spinning) and respective machineries. It also include evaluation of the effect of process parameters on quality of yarns produced on unconventional spinning systems.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	4	60	25	15			100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

BSC: basic science course /ESC: Engineering Science Course /HSM: Humanities and management /PCC: Professional Core course /PEC: professional Elective course /OEC: Open Elective course/ MD: mandatory non-credit course

Content:

Sr. No.	Content	Total Hrs
1	Requirements of Alternative spinning processes other than ring spinning. Possibilities for using the various spinning processes	5
2	**Open end Spinning Technology with detailing of Rotor Spinning**: (I) Introductory concept and principle of open end yarn formation process; Operating principles of various kinds of open-end spinning technologies (Such as rotor, friction, air-vortex, electrostatic, disc etc.) and their comparison; Advantages and Disadvantages of Open end spinning. (II) Overview of Open-end Rotor Spinning technologies with preparatory requirements of raw materials and processes; Objectives, Task, and Material flow of rotor spinning machine; Design and constructional aspects of the Rotor Spinning machine along with in depth study of machine elements such as Feed zone, Opening zone, transportation zone, yarn forming zone and withdrawal zone. Technological aspects of Rotor yarn formation in different zones such as fibre separation, fibre-flow speed, fibre transportation, Fibre deposition and back-doubling, formation of coherent fibre-ring, fibre twisting with false twist effect, wrapper fibres, Direction of withdrawal, winding requirements and packages etc. Rotor Specifications, Drive and Power consumption. Calculation related to production, twist, fibre speed, back-doubling etc. Rotor Yarn structural characteristics and properties along with comparison with Ring Spinning. Automation and Future scope of development	12
3	**Friction Spinning Technology:** Introduction and classification of Friction spinning in terms of technology used such as Open-end and wrap-spun (False-twisted). Objectives and tasks of each class of friction spinning systems; Requirements of raw materials and preparatory processes, Evolution of Master-spinners, DREF spinning versions such as DREF-I, DREFII, DREF-III, DREF-5, DREF-2000, DREF-3000 and DREF-5000 etc. and their operating principles; Technological aspects in brief such as influence of total draft, opening roller speed, delivery speed, Parameters of twisting drum and raw material properties on quality of friction spun yarn. Yarn characteristics of different classes	8

	of Friction spinning. Latest Developments of Friction spinning and their techno-commercial feasibilities. Yarn Application areas.	
4	**Air-Jet Spinning Technology:** Introductory concept of Air-jet spinning and its evolution; Operating principles of MJS, MTS and MVS; Mechanism of twisting and yarn formation; Requirements of raw materials and preparatory processes, Technological aspects in relation to draft, nozzle number and pressure, take-up ratio, delivery speed and raw material properties influencing yarn quality; Yarn structure and characteristics; Techno-economics, development trends and end-uses.	**10**
5	**Other Less popular Unconventional Spinning Technologies:** (A)Self-twist Spinning – Principle of self-twisting; Yarn formation mechanism with importance phase shifting; Operating principle of REPCO Spinning; Yarn structure and properties, End-uses. (B) Wrap Spinning – Concept of wrap spun yarn manufacturing by Hollow Spindle spinning; Working principles, structure, property and end-uses. (C) Twist-less Spinning – Limitations of various twisted spinning and emergence of Twist-less spinning; Classification based on fibre adhesion; brief processes of different twist-less yarn preparation techniques such as Twilo, Pavena, Tek-ja, Bobtex etc. Yarn Structure and property; Pros and cons of processes and end-uses.	**10**
		45

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**15**	**10**	**5**	**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:

Sr no	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	'New Spinning System'	by W. Klein	The Textile Institute Publication, Manual of Cotton Spinning, Short Staple Spinning Series		(volume-5)
2	Air jet spinning –		Textile Progress, Textile Institute Publication;		
3	'Advances in yarn spinning technology'	Edited by Carl A. Lawrence;	–The Woodhead Publishing Ltd.	2010	
4.	Fundamentals of Spun Yarn Technologies	Carl A. Lawrence	CRC Press ISBN 1-56676-821-7	2003	

5.	The Rieter Manual of Spinning- Rotor Spinning	Heinz Ernst	Reiter Machine Works ltd. ISBN:10 39523173-5-7	2014	**Vol. V**

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Classify, compare and categorize various unconventional spinning technologies.	15
CO-2	Illustrate basic principles and yarn forming mechanisms of market dominant unconventional spinning technologies such as Rotor, Air-jet and Friction spinning systems.	35
CO-3	Explain the basic know-how of Self-twist, Wrap and Twist-less spinning.	30
CO-4	Solve important mathematical problems and deduce scientific theories of unconventional spinning technologies in relation to rotor/friction/air-jet/self-twist yarn production.	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO-1	1	2	0	1	0	1	1	1	1	1	2	1	1	1	3
CO-2	1	2	0	1	0	1	1	1	1	1	2	1	1	1	3
CO-3	1	2	0	1	0	1	1	1	1	1	2	1	1	1	3
CO-4	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
Rationale*															

Rationale*: Explaining why it is matching this particular program outcome
Knowledge of unconventional spinning techniques fulfills the PO's.

List of Open learning website:

List of Open Source Software: : https://nptel.ac.in

FOR LAB SESSIONS:

List of Experiments:

1. To study Principle and raw material preparation for air jet spinning.
2. To study Principles of operation of MJS, MTS and MVS systems and difference between air jet spun and vortex spun yarn structures.
3. To study Process variables and machine parameters affecting the product quality.
4. To study Yarn properties, limitations and some of the important applications.
5. To study the passage of yarn through rotor spinning machine.
6. To study the yarn formation mechanism in rotor spinning machine.
7. 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.
8. Production calculation of rotor spinning
9. To study the passage of yarn through DREF1, DREF2, DREF3, DREF5, DREF2000, DREF3000 Friction spinning machine.
10. To Study the working principle of all friction spinning machine and yarn characteristics and application of friction spun yarn.
11. Production of yarn by using twist less, self twist, wrap spinning, siro and solo spun yarn technique.

Major Equipment Needed: Rotor Spinning machine, Air Jet Spinning machine, Friction Spinning machine, Twist less spinning machine.