GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3152909
Semester V

Subject Name : Fabric Formation III

Type of course : Professional Core Course

Prerequisite : Students should have knowledge of Weaving Preparatory, shuttle loom, dobby and jacquard mechanisms.

Rationale : Weaving is the one of the major processes for grey fabric formation. Shuttle less systems are replacing old type shuttle looms at a very fast rate.

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	4	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Drawbacks of a shuttle loom, Basic principle of the shuttle less system, Functional principles of shuttle less weft insertion **Projectile loom:** Partially guided solid carrier i.e. projectile or gripper, Types of projectiles and projectile guides, torsion picking mechanism, projectile brake system, cam beat-up mechanism, cycle of operation in projectile loom, Typical velocity and acceleration profiles of picker shoe along with a velocity profile of gripper **Rapier Loom:** Fully guided solid carrier i.e. rapier system of weft insertion – Flexible and Rigid system and their cycle of operation, Rapier heads design, study of weft velocity on rapier. Functional description of flexible rapier weaving machine.	**12**
2	Basic concepts of fluid carrier i.e. Air jet and water jet **Air-jet:** Yarn insertion Systems, Principles of Air jet filling insertion, Types of nozzles and guides, Performance of yarns in air jet insertion, Functional characteristics of modern air jet weaving machines. **Water jet:** Requirements of water for water jet loom. Weft insertion on water jet loom. Picking mechanism, Features of modern water jet loom -advantages & problems. Weft waste on jet loom.	**12**
3	**Nonwoven** Introduction, Definition, Classification, Market growth of nonwoven industry, Raw materials	**10**

	for nonwovens Web formation - Staple fiber web formation system, Polymer lay process Bonding - Mechanical bonding, Chemical bonding, Thermal bonding, Comparison of different web bonding techniques Finishing - Mechanical finishing, Chemical finishing Measurement/testing of Fiber orientation, fabric porosity, pore size, pore size distribution, pore shape Application – Geotextiles, Automotive, Filtration, Medical & Hygiene	
4	**Other Fabric Formations Techniques:** Principle, Structure and Application of Narrow Weaving, Circular Weaving, Leno Weaving, Braiding and 3D Woven Fabric.	**8**

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
10	**25**	**30**	**5**	**0**	**0**

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. Handbook of weaving, by Sabit Adanur,Technomic publication, 2003
2. Weaving machine, mechanism and management: M K Talukdar and others.
3. Principles of weaving: R. Mark and T. C Robinson (Textile Institute).
4. Advances in Modern Woven Fabrics Technology by Savvas Vassiliadis,InTech, 2011
5. Nonwovens: Process, structure, properties and applications by T. Karthik & others, Woodhead Publishing India Pvt. Ltd.
6. Advances in Technical Nonwovens Edited by George Kellie, Woodhead Publishing in association with The Textile Institute.
7. Handbook of Nonwoven, by S J Russel, Woodhead Publication, 2007
8. Principles of Fabric Formation by Prabir Kumar Banerjee, CRC Press

Course Outcomes: After learning the course, students should be able to:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Classify the fabric formation machines based on developments and application.	10

CO-2	Understand the working of elements of different fabric formation machines.	35
CO-3	Compare the weft insertion cycle of shuttleless machines.	25
CO-4	Calculate the WIR and production rate of the weaving machine.	10
CO-5	Describe principle of web formation and bonding of nonwoven fabric and list applications of nonwoven fabrics.	20

List of Experiments:

1. Study of different selvedge formation on shuttleless loom.
2. Study of weft measuring device of shuttleless loom.
3. Study of E-shedding in shuttleless weaving.
4. Study of Electronic let off and electronic take up system in shuttleless weaving.
5. Study of cam beat up mechanism of shuttleless loom.
6. Study of different parts and passage of warp and weft yarn through airjet loom.
7. Study of Shedding and Picking mechanism of airjet loom.
8. Study of let-off and cloth take-up mechanism of airjet loom.
9. Study of air supply system of air jet loom.
10. Study of different parts and passage of warp and weft yarn through rapier loom.
11. Study of Shedding and Picking mechanism of rapier loom.
12. Study of let-off and cloth take-up mechanism of rapier loom.
13. Study of different parts and passage of warp and weft yarn through projectile loom.
14. Study of Shedding and Picking mechanism of projectile loom.
15. Study of let-off and cloth take-up mechanism of projectile loom.
16. Study of water jet picking system and their settings.
17. Calculations pertaining to shuttleless looms.
18. Study of Production of needle punched nonwoven fabrics for specific applications.
19. Study of Production of chemical and thermal bonded nonwoven fabrics.
20. Evaluation and characterization of nonwoven developed fabrics for particular applications.
21. Study of Production of braided cords/ropes.
22. Study of Production of narrow and circular woven fabric.
23. Report of the Industrial visit.

Major Equipment: Projectile loom, Rapier loom, Air jet loom, Water jet loom, Needle Punch Machine, Braiding Machine, Narrow Weaving Machine etc.

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