GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3142906
Semester: B.E. Semester IV

Subject Name: Fabric Formation II

Type of course: Professional Core Course

Prerequisite: Students should have knowledge of basics of textile and preparatory processes for warp and weft yarns meant for weaving.

Rationale: Weaving is one of three important method of fabric formation. The main device for making woven fabric, loom, has undergone developments from non automatic to latest generation shuttleless looms. Also various ways of manipulating warp and weft yarn for manufacturing various woven structures have evolved fully.

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	**Plain Power Loom:** Classification of looms, Passage of yarn through loom. Idea about cycle of loom and various motions, Loom drives, Loom timing. **Primary Motions** **Shedding:** Types of sheds, types of shedding, Tappet shedding – Positive and negative tappets, Reversing mechanisms, limitations of tappet shedding, heald staggering, geometry of the shed, depth of the shed, Designing of shedding tappet. **Picking:** Introduction to shuttle picking, classification, shuttle timing. cone under pick mechanism, advantages and limitations, shuttle checking, relation between shuttle velocity and loom speed, loom width and rate of weft insertion, expression for power required for picking, **Beat Up:** Movement of sley, beat up, sley eccentricity and the factors influencing it, timing available for shuttle flight, Beat up force **Secondary Motions:** Take up motion: Objectives, negative and positive take up systems, seven wheel take up mechanism with change wheel and pick wheel calculation. Let off motions: Negative and positive let off motions, tension variations factors **Auxiliary Motions:** Temples, Weft stop - side fork and center fork motions, Type of drop wires, castellated bars, mechanical and modern electrical warp stop motion, loose reed and fast reed - warp protector	**16**

	motions. Calculation for production and efficiency related to weaving. **Drop Box Motions:** Introduction and importance, Types of Multiple box motion, 4x1, Eccle's drop box motion, box plan and pattern card for box change	
2	**Automatic Loom** Classification of Automatic Shuttle Looms, Classification of Weft Feelers, Object, construction, working and important settings of midget, 2- prong electrical and photoelectric weft feelers, automatic cop change mechanism – Its object, construction, working and requirements for efficient working, temple cutter and shuttle eye cutter, changes required to convert plain loom to semi-automatic power loom	**8**
3	**Dobby shedding:** Introduction and importance, Classification, Detail study of Keighley, Cam, Rotary & Electronic dobbies, Preparation of chain for different kinds of design used in dobby, advantages of papers card over wooden leg pattern card **Jacquard shedding:** Introduction and importance, Classification, Scope of jacquard and functions of different parts like hooks, needle, harness, comber board etc., Double lift double cylinder & electronic jacquard., Harness ties, Casting out **Concept of E-shedding**	**12**
4	**Introduction to Shuttleless weaving:** Classification, Warp and weft yarn quality requirements for shuttleless weaving, Storage and measuring devices for shuttleless looms like accumulators, weft measuring drums etc. Detailed study of drum type accumulator., Various type of selvedges used in shuttleless weaving.	**6**

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. Woven Fabric production – I The Plain Power Loom, NCUTE publication
2. Woven Fabric production – II Automatic Looms, NCUTE publication
3. Principles of Woven Fabric Manufacturing: Abhijit Majumdar (CRC Press)
4. Handbook of Weaving: Adanur Sabit.

5. Principles of weaving: R. Mark and T. C Robinson (Textile Institute).
6. Principles of Fabric Formation, P.K.Banerajee, CRC Press
7. Woven Textiles - Principles, Technologies and Applications: K Gandhi (Woodhead Publishing)
8. Weaving: Conversion of Yarn to Fabric: Lord and Mohamed.
9. Weaving Technology and Operations : A Ormerod and W S Sondhelm.
10. Textile Mathematics: J. E. Booth (Volume III)

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

Sr. No.	CO statement	Marks % weightage
CO-1	Understand basic concepts and process of weaving process.	20
CO-2	Apply the knowledge of shedding, picking, beat up and other mechanism of loom for fabric.	30
CO-3	Understand the objectives and operating principle of automatic loom, dobby and jacquard.	30
CO-4	Understand working of drop box. Explore areas of application of drop box.	10
CO-5	Calculate the production and efficiency of weaving process.	10

List of Experiments:

1. Study of different parts and passage of warp sheet through plain power and automatic shuttle loom.
2. Study of loom drive and timing diagram of shuttle loom.
3. Study of tappet and cam shedding mechanism of shuttle loom.
4. Study of picking mechanism of shuttle loom.
5. Study of sley and cam beat-up motion and calculation of sley eccentricity.
6. Study of positive and negative let-off motion.
7. Study of different temples and take up motion, calculation of loom take up dividend.
8. Study of loose reed and fast reed warp protection motion.
9. Study of mechanical and electrical type warp stop motion.
10. Study of side and centre weft fork mechanism.
11. Study of multiple drop box motion.
12. Study of mechanical and electronic dobby.
13. Study of mechanical and electronic jacquard.
14. Study of different weft feelers.
15. Study of cop change mechanism and important timing & settings.
16. Study of weft accumulator.
17. Report of the Industrial - Mill visit.

Major Equipment: Plain power loom, automatic shuttle loom. Drop box, dobby and jacquard attached loom etc., weft accumulators etc.
List of Open Source Software/learning website: https://nptel.ac.in, brochures and manuals of machine manufacturer, World Wide Web, Google Search Engine etc.