

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: MODERN WEAVING TECHNOLOGY
(COURSE CODE: 3362902)**

Diploma Program in which this course is offered	Semester in which offered
Textile Manufacturing Technology	Sixth

1. RATIONALE

The emphasis on productivity and quality has forced the weaving technology to evolve new processes and equipment. The result is that working hours required to weave fabric from loom have been reduced from about 20 to 0.25 during the last 125 years, and in the last 50 years there has been a reduction of 95% in operative hours per standard unit produced. Majority of the developments are taking place on the shuttle less looms. Due to this technological change basic need of industries also changes. To fulfill the industries requirement of highly skilled technicians in modern weaving area, this course has been designed. It is therefore an important course for textile engineers.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency required by the industry:

- **Operate modern looms to produce quality fabrics.**

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

- Manage preparatory processes of shuttle less weaving process.
- Undertake weaving production equipment in weft insertion by projectile method.
- Undertake weaving production equipment in weft insertion by rapier technology.
- Undertake weft insertion by air jet technology.
- Undertake weft insertion by water jet technology.
- Undertake multiphase weaving and tri-axial weaving process using unconventional looms.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P -Practical; C – Credit;; ESE -End Semester Examination; PA - Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
Unit – I Preparatory Processes for Shuttle Less Weaving	1a. Describe types of shuttles looms. 1b. Differentiate Conventional and Shuttle less looms. 1c. Describe modern developments and process parameters for preparatory process. 1d. Describe the need of weft accumulator on shuttle less looms	1.1 Comparison between conventional and shuttle less looms. 1.2 Shuttle less weaving machines: Types 1.3 Modern developments and processing parameters for Quality Yarn preparation: Winding, Warping, Sizing 1.4 Unconventional weaving machines: Weft accumulator, Weft measuring systems, Weft cutters
Unit– II Weft Insertion by Projectile and Rapier	2a. Explain features projectile weaving. 2b. Explain working of torsion picking mechanism. 2c. Describe the beat up mechanism on Sulzer loom. 2d. Describe types of selvages used. 2e. Identify Rapier weaving machines. 2f. Describe the weft insertion system on rapier weaving machine. 2g. Differentiate types of rapier heads.	2.1 Projectile weaving machine: features and use 2.2 Weft insertion sequence in projectile weaving machine 2.3 Principle of torsion picking mechanism, 2.4 Beat up mechanism on Sulzer loom 2.5 Selvedge formation in projectile looms 2.6 Rapier weaving machines: Rigid, Flexible 2.7 Weft insertion methods: Dewas system, Gabler system 2.8 Rapier heads
Unit–III Weft Insertion by Air Jet	3a. Describe the working of an Air-jet weaving machines. 3b. Differentiate types of Air guide. 3c. Justify the need of quality air. 3d. Describe the methods of air jet control 3e. Describe the weft insertion in Air Jet looms.	3.1 Essential Requirements of success full Air-jet 3.2 Weft insertion. 3.3 Types of Air guide: Insertion configurations, 3.4 Confuser: Mono Nozzle, Multi Nozzle and Reed Profile 3.5 Quality of Air: Methods of Air jet control / air distribution control 3.6 Sequence of weft insertion in Air jet looms
Unit–IV Weft insertion by Water jet	4a. Differentiate between air jet and water jet. 4b. Justify the importance of water quality. 4c. Distinguish the weft supply system and picking system	4.1 Air jet and water jet 4.2 Water quality 4.3 Weft supply system on Water jet loom 4.4 Picking system of the Water jet loom 4.5 Weft insertion in Water jet loom

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
	on Water Jet 4d. Describe weft insertion in Water jet	
Unit-V Multiphase and Tri-axial Weaving and Un- Conventional Looms	6a. Describe advantages and limitations in Multiphase loom 6b. Describe the warp way multiphase loom 6c. Describe the weft way multiphase loom 6d. Explain working principle of Triaxial weaving 6e. Explain latest developments in unconventional looms.	6.1 Multiphase weaving machine 6.2 Warp way Multiphase weaving machine 6.3 Weft way Multiphase weaving machine 6.4 Triaxial weaving 6.5 Quick style change (QSC) and Automation in: Drawing in, Variable Pick density, Variable speed, On loom inspection, On line loom monitoring system, Electronic shedding, Electronic take up and let off motion 6.6 Automatic stop mark prevention 6.7 Modifications in Weft Insertion system in AJ loom: Tapered Sub Nozzles, Tandom Nozzles, Tapered Tunnel Reed 6.8 Automatic pick controller

6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Preparatory Processes For Shuttles Weaving	6	2	4	2	8
II	Weft Insertion by Projectile and Rapier	14	4	12	6	22
III	Weft Insertion by Air Jet	8	2	6	4	12
IV	Weft Insertion by Water Jet	6	2	6	3	11
V	Principle of Multiphase and Tri-axial Weaving	8	3	10	4	17
	Total	42	13	38	19	70

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised 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

7. SUGGESTED PRACTICAL EXPERIMENTS/ EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical Experiment/Exercise (Outcomes in Psychomotor Domain)	Approx Hours Required
1	I	Locate advantages in various types of shuttleless looms.	02
2	II	Draw sketch and explain weft insertion sequence in projectile loom.	06
3	II	Draw sketch and explain beat up mechanism in projectile loom.	04
4	II	Draw sketch and explain torsion bar picking mechanism in projectile loom.	06
5	II	Locate types of selvedge formation.	04
6	III	Draw sketch and explain dewas weft insertion system in rapier loom.	06
7	III	Draw sketch and explain gabler weft insertion system in rapier loom.	06
8	IV	Draw types of air guides used in Air Jet loom.	04
10	IV	Draw sketch and explain weft insertion sequence in Air Jet loom.	06
11	V	Draw sketch and explain picking system, in Water Jet loom.	06
12	V	Draw sketch and explain weft insertion system in Water Jet loom.	06
13	VI	Survey types of multiphase weaving machines.	02
14	VI	Draw sketch and explain principle of Triaxial weaving.	02
15	VII	Observe and record latest developments in unconventional looms.	02
16	VII	Observe and record Modifications in Weft Insertion system in Air Jet loom	02
Total			66
Note: Perform any of the practical exercises from above list for total of minimum 28 hours depending upon the availability of resources so that skills matching with the most of the outcomes of every unit are included.			

8. SUGGESTED STUDENT ACTIVITIES

- i. Literature survey for different shuttleless weaving machine with model and specifications
- ii. Prepare sketches and model for Weaving motions on Projectile and Rapier Looms.
- iii. Label each part of Air Jet weaving machine and write their functions
- iv. Differentiate right hand and left hand rapier head.
- v. Observe timing and setting of weft insertion system in Air Jet looms
- vi. Study warp way and weft way multiphase looms.
- vii. Visit to Industries for study of Shuttleless looms.
- viii. Identify important parts of Water Jet looms.
- ix. Study torsion bar mechanism on Projectile looms.
- x. Identify important parts of rapier picking system.
- xi. Identify important parts of Triaxial weaving machine.
- xii. Prepare charts for different picking system used in Shuttleless looms.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Educational Video and CDs
- ii. Prepare models
- iii. Arrange Expert lectures by textile engineers
- iv. Arrange visit to nearby textile industry, which is using the latest technology.

10. SUGGESTED LEARNING RESOURCES**A) Books**

S.No.	Author	Title of Books	Publication
1	Talukdar, Sriramulu and Ajsaonakar	Weaving machine, material and management	Mahajan Publishers Private Limited, Ahmedabad
2	Vinscent	Shuttleless loom	The Textile Institute
3	Benarjee N. N .	Weaving mech. II	Textile Book House
4	Ormerod. A. and Sondhelm. W.S.	Weaving Technology and operations	Butterworth and Co.
5	Marks, R. and Robbinsons	Principle of weaving	The Textile Institute Manchester
6	Duxbury and Ray	Modern Developments in Weaving	Metuchen N.J. Textile Book Service
7	Sabit Adanur	Handbook of weaving	Woodhead Publishing

B) Major Equipment/ Instrument with Broad Specifications

S.No.	Machine Name	Specification
i	Air Jet Loom	<ul style="list-style-type: none"> •Speed of machine : up to 1000 rpm •Loom Width : up to 165 cm
ii	Rapier Loom	<ul style="list-style-type: none"> •Speed of machine : up to 700 rpm •Loom Width : up to 165 cm
iii	Projectile Loom	<ul style="list-style-type: none"> •Speed of machine : up to 500 rpm •Loom Width : up to 320 cm

C. Software /Learning Websites

- i. www.scribd.com/doc/86427900/Preparatory-Process-for-Weaving
- ii. www.itemagroup.com/documents/brochures/p7300hp/P7300HP_EN.pdf
- iii. <http://textilelearner.blogspot.in/2012/01/projectile-loop-projectile-weaving.html>
- iv. www.fibre2fashion.com/industry.../weaving-weft-insertion-rapier1.asp
- v. www.rapierloom.in/rapier-looms.html
- vi. <http://textilelearner.blogspot.in/2013/01/main-parts-of-air-jet-loom-for-weft.html>
- vii. www.indiantextilejournal.com/articles/FAdetails.asp?id=4557
- viii. www.youtube.com/watch?v=s0W0iDj7_hc
- ix. [www.qqm.cz/link/weaving%20machines%20\(looms\).pdf](http://www.qqm.cz/link/weaving%20machines%20(looms).pdf)
- x. www.sulzer.com/mr/-/media/.../Cross.../1999_03_8_sartorius_e.pdf
- xi. [http://nopr.niscair.res.in/bitstream/123456789/19309/1/IJFTR%2019\(3\)%20172-176.pdf](http://nopr.niscair.res.in/bitstream/123456789/19309/1/IJFTR%2019(3)%20172-176.pdf)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. V. N. Soni**, HOD Textile Manufacturing , R.C T I, Ahmedabad
- **Prof.(Ms.) S. S. Parmar**, Lecturer in Textile Manufacturing, R.C T I, Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh**, Professor, Department of Mechanical Engineering
- **Dr. Joshua Earnest**, Professor Department of Electrical and Electronics Engineering