

Program Name : Diploma in Textile Manufacturers
Program Code : TX
Semester : Third
Course Title : Warp Yarn Preparation
Course Code : 22366

1. RATIONALE

Weaving for textile is an important activity for any textile engineer. The knowledge of basic process such as warping and sizing are essential process of any weaving technique. This course will help the diploma engineer to develop woven fabric using principle of warping and sizing. Fundamental information of warp preparation will help him/ her to apply the basic concepts of preparatory process to deliver relevant package for sizing. Sizing process will help weaving process by developing relevant package with known length parameters. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts of warping and sizing in various fabric producing methods in solving broad based textile weaving problems.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Use principles of warping and sizing process to prepare raw material for weaving process.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Select relevant warping machine for manufacturing weavers beam.
- Use beam warping machine to convert single end package into multi end package.
- Use sectional warping machine to produce stripped color pattern weaver's beams.
- Use sizing process to capsule the yarn surface.
- Select relevant sizing process parameters for types of yarn.
- Use quality control parameters to produce quality sized yarn.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Paper Hrs.	Theory						Practical					
					ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.



Legends: *L* - Lecture; *T* - Tutorial/Teacher Guided Theory Practice; *P* - Practical; *C* - Credit, *ESE* - End Semester Examination; *PA* - Progressive Assessment

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

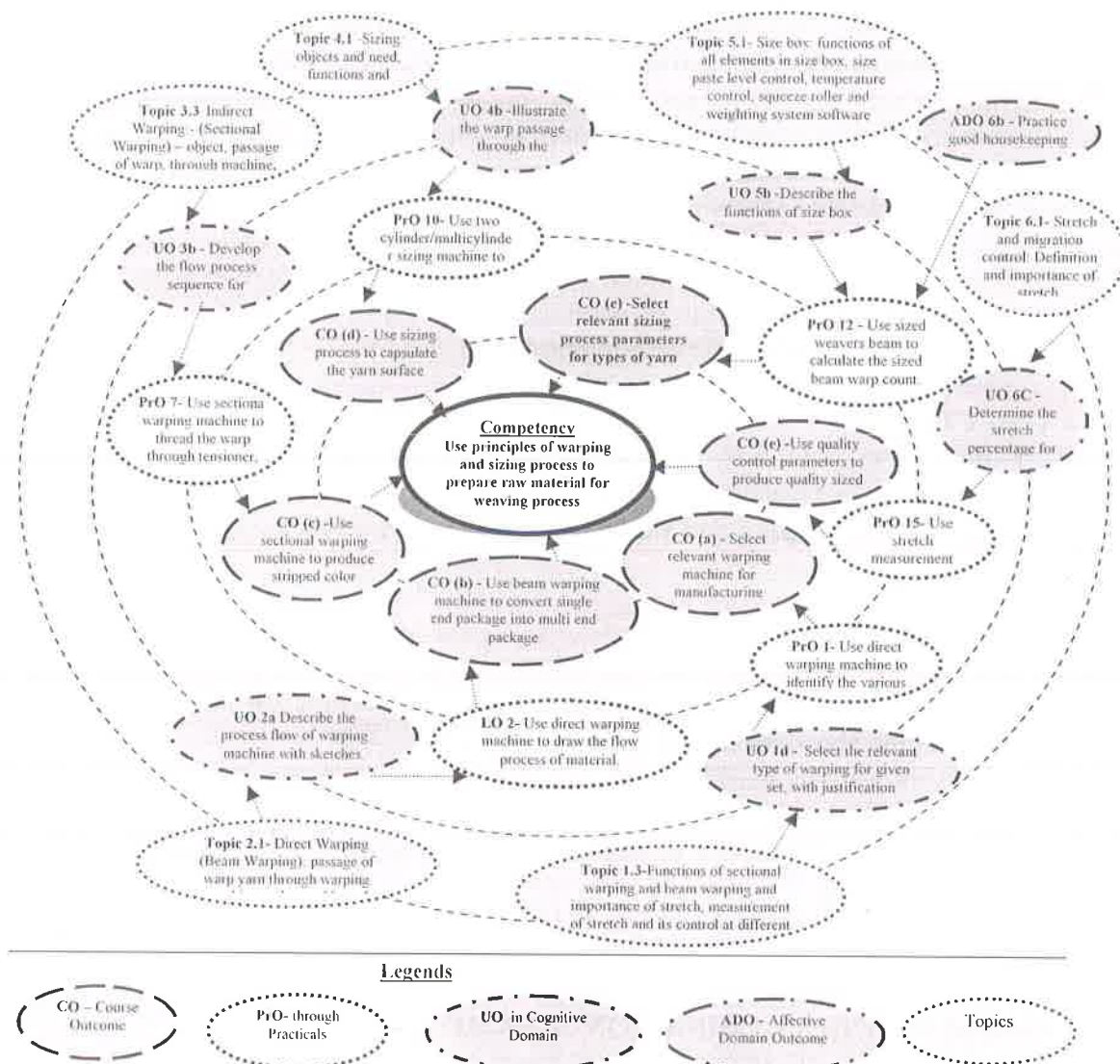


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Use direct warping machine to identify the various elements of warping machine.	I	02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
2	Use direct warping machine to draw the flow process of material.	II, III	02
3	Use direct warping machine to: a. Estimate creel capacity for given warping set. b. Creel and decreel as per estimated creel capacity.	II	02*
4	Use fabric five samples , a. Select relevant warping process. b. Calculate number of beams/sections required for further process.	III,II	02
5	Use five stripe pattern fabrics to: a. Calculate the number of ends on weavers beam. b. Estimate number of sections on sectional drum. c. Calculate the sectional and beam width.	III,II	02*
6	Use five check pattern fabrics to: a. Calculate warp color pattern/repeat and total number of warp repeats. b. Estimate rearrangement of color warp patterns in a section. b. Arrange color cones in the creel.	III	02
7	Use sectional warping machine to thread the warp through tensioner, thread guide, comber board and sectional reed.	III	02
8	Use given fabric length parameter of warping machine to: a. Estimate warp length for each beam/section. b. Estimate the number of beam/section required.	II, III	02
9	Use section warping machine to insert lease band while preparing sections for weavers beam.	III	02
10	Use section/beam warping machine to estimate the production of warp in kg/shift or meters/shift for given data.	II, III	02
11	Use two cylinder/multicylinder sizing machine to draw the process flow of material for given quality.	IV,V	02
12	Use size box to sketch outline of various elements and write their functions.	IV,V	02
13	Use sized weavers beam to calculate the sized beam warp count.	IV	02*
14	Use tensile strength instrument to measure increased yarn strength of given sized yarn.	V	02*
15	Use stretch measurement instrument to measure stretch percentage of given sized yarn.	VI	02*
16	Use sizing machine to measure migration of warp for given warp.	VI	02
17	Observe and record the formulation of size paste.	VI	02
Total			34

Note

- i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.



ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Safety measures	10
4	Observations and Recording	10
5	Interpretation of result and Conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Practice energy conservation.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Beam warping machine with working width of 1800-2400 mm	1 to 10
2	Section warping machine with speed of 1000meters/min	1 to 10
3	Check and striped Fabric with EPI less than 60 and PPI less than 40	1 to 10
4	Sizing machine with Two/multicylinder drying system	11 to 16
5	Tensile strength tester with CRE principle	11 to 16

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Basics of Warping	1a. Classify the given types of warping processes. 1b. Describe the functions of given warping process. 1c. Select the relevant type of warping for given set, with justification. 1d. Describe the specified winding package used for working.	1.1 Necessity and function of warping. 1.2 Types of warping: beam warping, section warping, single end warping. 1.3 Functions of sectional warping and beam warping. 1.4 Types of different winding packages used for warping.
Unit– II Beam warping	2a. Select relevant creel for given quality with justification. 2b. Select suitable tensioner for given type of yarn with justification. 2c. Select relevant tension range for given yarn with justification. 2d. Calculate the number of ends on warpers beam for given set. 2e. Determine the production in kg/shift for given data and situation. 2f. Calculate the number of warping beams for sizing for the given situation.	2.1 Direct Warping (Beam Warping): passage of warp yarn through warping machine, working of spindle driven/ Drum warping machines. 2.2 Creel: Types, Merits and demerits, modern creel. Study of automations in creels and creeling 2.3 Tensioner: Necessity, Types, pre-tensioner, pneumatic tensioner, central control of tension, Range of tension. Merits and demerits of tensioner. 2.4 Head Stock details: spindle and drum drive, braking arrangements, expanding comb, manual and automatic doffing, system to give pressure on beam, 2.5 Stop motions: working, types, significance and effect on beam quality. 2.6 Calculation: production, number of beams in set, efficiency by time loss method, beam quality factors.
Unit– III Sectional warping	3a. Describe the given process sequence for producing stripe pattern. 3b. Describe the leasing principle to introduce leases during the given operation. 3c. Determine the creel capacity for given quality of fabric for the given situation 3d. Determine the section width and number of sections for the fabric quality for the given number of ends and creel capacity. 3e. Calculate number of weavers beam in stipulated time period.	3.1 Indirect Warping:- (Sectional Warping) – object, passage of warp, through machine, preparation of sections, construction of warping drum, lease rod, section reed, traverse motion. 3.2 Section warping, leasing, beaming and creeling for colour patterns, Introduction to colour master used for creeling. 3.3 Automations in creels and creeling. Salient features of Modern Warping machines. 3.4 Production and efficiency of indirect Warping machine. Number of sections and section width for Sectional Warping.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit-IV Basics of sizing	4a. Describe with sketches the warp passage through the given sizing machine. 4b. Differentiate the salient features between the given two types of sizing machines. 4c. Select suitable sizing ingredient for preparation of size paste for given yarn type with justification.	4.1 Sizing: objects, functions and importance, passage of warp through two cylinder and multicylinder sizing machine. 4.2 Size paste preparation: functions of Sizing ingredients, cooking of size paste, pressure cooker and storage. 4.3 Size paste properties: congealing and keeping properties and their importance. Viscosity and concentration of size paste. Testing of adhesives.
Unit –V Sizing machine components	5a. Select the suitable creel for given set of beams with justification. 5b. Describe with sketches the functions of the given size box. 5c. Choose the suitable parameters of saw box for the given yarn with justification. 5d. Describe with sketches the functions of given zone. 5e. Choose the sequence of sizing process for given yarn with justification.	5.1 Creel: types, merits and demerits of various types of creel. 5.2 Size box: functions of all elements in size box, size paste level control, temperature control, squeeze roller and weighting system, immersion roller. Wet splitting & its importance. 5.3 Automatic size box, construction and working. 5.4 Drying zone: multi-cylinder drying, removal of condensed water, Teflon coating, temperatures and its control. 5.5 Splitting zone: leasing, splitting, moisture control device. 5.6 Details of headstock, marking and measuring device, comb, sheeting rollers, drag roller. drive to the weavers beam. PIV gears, differential cone drive, multi-motor drive.
Unit-VI Quality aspects of sizing	6a. Describe the given ingredients of paints and their function. 6b. Determine the stretch percentage for given type of yarn. 6c. Determine the migration for given set of yarns. 6d. Calculate the size pickup for given yarn type. 6e. Determine the sized warp yarn count for the given weavers beam.	6.1 Stretch and migration control: Definition and importance of stretch, measurement of stretch and its control at different zones (stretch meter), definition of lappers and migration, measurement of Migration. 6.2 Size pick up: requirement of size pick up, size add-on, factors effecting size pickup. Testing of sized yarn 6.3 Calculations of efficiency, dead loss, count of sized beam warp.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'.



9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of warping	08	04	04		08
II	Beam warping	12	04	04	04	12
III	Sectional warping	12	04	04	06	14
IV	Basic of sizing	08	02	04	06	12
V	Sizing machine components	12	02	04	06	12
VI	Quality aspects of sizing	12	02	04	06	12
Total		64	18	24	28	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Use of video, animation films to explain principle of direct/sectional warping, basics of sizing process.
- Visit to modern warping unit to know the working principle of various elements.
- Visit to modern sizing unit to know the working of sizing machine.
- Prepare catalogue showing features of modern sizing and warping machine.

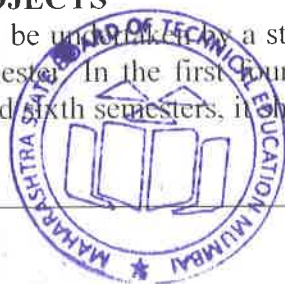
11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Guide student(s) in undertaking micro-projects.
- Use Flash/Animations to explain various Principles of sizing.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually**



undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Basics of warping:** Collect the photographs of sectional/beam warping machine and stick on card sheet by listing the features of both machine.
- Beam warping:** Collect the photographs of various creels, tensioning devices and prepare booklet by writing their features.
- Beam warping:** Collect the photographs of various tensioning devices and stick on card sheet by writing features of each tensioning device.
- Beam warping:** Prepare chart of various tension ranges for various types of yarns.
- Sectional Warping:** Collect photographs of sequence of leasing operation and stick over black card sheet.
- Sectional Warping:** Prepare comparative table of salient features of various sectional/direct warping machine manufacturer.
- Basics of Sizing:** Prepare card sheet showing passage of warp trough sizing machine and collect the photographs of various types of creel used for sizing and label the features of the each creel.
- Size machine components:** Draw labeled sketch of modern size box. Collect the photographs of various size boxes components and prepare booklet by writing features of each components and sticking on card sheet.
- Quality aspects of Sizing:** Conduct the study of migration on sizing machine and find the consequence of the same on further quality of material.

13. SUGGESTED LEARNING RESOURCES

S. No	Title of Book	Author	Publication
1	Weaving Conversion of Yarns to Fabric	Lord P.R	Woodhead Publication ISBN:1 855734834
2	Textile Sizing	Bhuvnesh C. Goswami, Rajesh D. Anandjiwala, David M. Hall	Marcel Dekker, New York ISBN: 0-8247-5053-5
3	Weaving: Machines, Mechanisms, Management	Talukdar M.K., Ajgaonkar D.B., Sriramulu P.K	Mahajan Publisher Private Ltd, ISBN:81-85401-16-0
4	Modern Preparation and Weaving Technology	Ormerod A.	Butterworth, (Publishers), 1983, ISBN: 9780408012126
5	Winding and Warping	Talukdar M.K.	Mahajan Publisher Private Ltd.
6	Industrial Practices in	M K Singh, G	Woodhead Publishing



S. No	Title of Book	Author	Publication
.	Weaving Preparation	Kanpur, India	India title, ISBN: 978 0 85709 825 2

14. SUGGESTED SOFTWARE/ LEARNING WEBSITES

- a. www.nptel.ac.in/courses/116102005/16
- b. www.nptel.ac.in/courses/116102005/19
- c. www.karlmayer.com/en/products/warp-preparation/creels/yarn-tensioners-yarn-stop-motions/
- d. www.karlmayer.com/en/products/warp-preparation/sectional-warpers/automatic-sectional-warpers/
- e. www.youtube.com/watch?v=fAvLgG8R100
- f. en.wikipedia.org/wiki/Textile_sizing_machine
- g. textilecalculation.blogspot.com/2014/12/mathematical-problems-of-sizing-in-weaving.html
- h. textilecalculation.blogspot.com/2015/06/production-calculation-of-slasher.html
- i. www.fibre2fashion.com/industry-article/5717/sizing-impact-of-process-parameter-on-beam-quality
- j. nopr.niscair.res.in/bitstream/123456789/32473/1/IJFTR%2018%284%29%20165-169.pdf

