Program Name	: Diploma in Textile Manufacturers
Program Code	**: TX**
Semester	**: Fourth**
Course Title	**: Roving and Ring Spinning**
Course Code	**: 22461**

1.   RATIONALE

Yarn is the basic component of fabric and roving and ring spinning is the process of making yarn from fiber. Roving is the process of preparing compact rove package from the prepared sliver obtained from draw frame. This rove package is further used as raw material to ring frame machine. The object of ring frame is to produce fault free and even yarn by drafting, twisting, winding and building a compact yarn package from rove. Thus this course teaches the processes of making ring yarn. It is thus a core course for textile manufacturing engineers.

2.   COMPETENCY

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

- **Produce ring yarn using the principles of drafting, twisting, winding and package building.**

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:

  a. Produce rove from different hanks of draw frame slivers.
  b. Choose relevant values of different parameters to produce quality rove.
  c. Develop ring yarn using roving.
  d. Select ring and traveller to produce yarn.
  e. Build compact and fault free ring yarn package.
  f. Use monitoring system to control the evenness of yarn.

4.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
				Paper Hrs.	Theory						Practical					
L	T	P			ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	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 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.
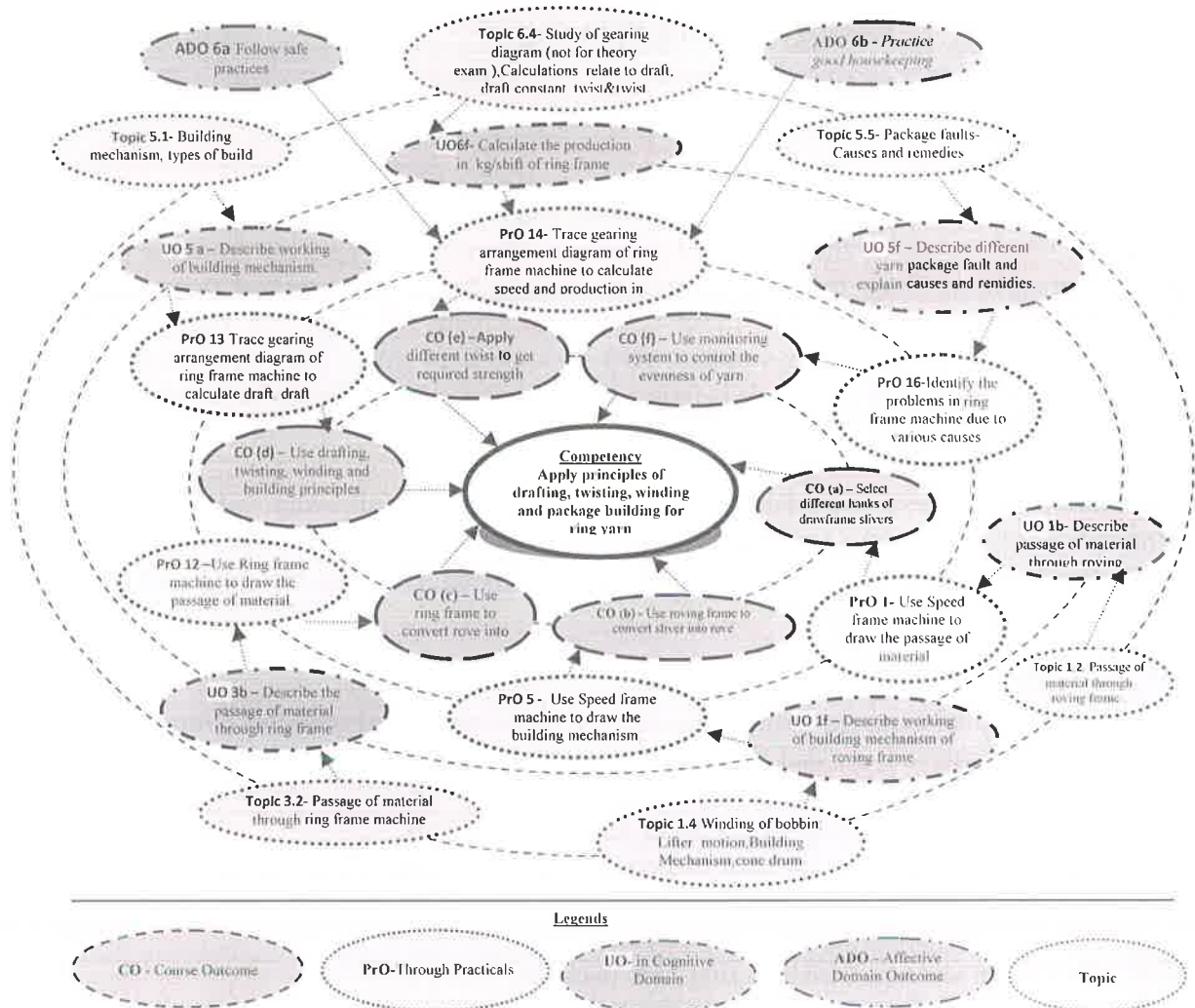

Figure 1 - Course Map

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	Draw sketch showing passage of material through Speed Frame (in working condition)	I	02*
2	Draw Gearing plan of speed frame machine to calculate speed and production in kg/shift.	I	02
3	Draw Gearing plan of Speed frame machine to calculate draft, draft constant, twist and twist constant.	I	02
4	Use speed frame machine to draw working condition of drafting system by.	I	02
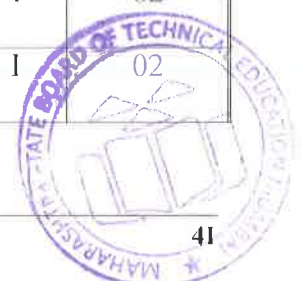
S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
5	Use speed frame machine to draw working condition of differential motion by.	II	02*
6	Use speed frame machine to draw working condition of building mechanism by..	II	02
7	Identify the problems in speed frame machine due to various causes.	II	02
8	Use Ring frame machine to draw the passage of material.	III	02*
9	Use tools and gauges of ring frame machine Set rings and travellers by.	IV	02*
10	Use tools and gauges to set lappet and spindle of ring frame machine.	IV	02
11	Use tools and gauges to level ring rail of ring frame machine.	V	02*
12	Use ring frame machine to draw the working condition of building mechanism.	V	02
13	Trace gearing arrangement diagram of ring frame machine to calculate draft, draft constant, twist and twist constant.	VI	02*
14	Trace gearing arrangement diagram of ring frame machine to calculate speed and production in kg/shift.	VI	02
15	Identify the problems in ring frame machine due to various causes.	VI	02
16	Locate the advance features in modern ring frame machine	VI	02
	Total		**32**

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 judicial 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:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.

   d. Maintain tools and equipment.

   e. 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 and
- '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	Conventional Speed Frame Machine (Spindle speed 700 rpm ,Bobbin weigth -1 kg ,lift 8 inch)	1,2,3
2	Modern Speed Frame Machine (Spindle speed 1400 rpm ,Bobbin weigth -2 kg, lift 10 -12 inch)	4,5,6,7
3	Conventional Ring Frame Machine (Spindle speed 10000 rpm ,Bobbin weigth -50gm , lift 4 inch)	8,9,10, 11
4	Modern Ring Frame Machine (Spindle speed 22000 rpm ,Bobbin weigth - 80gm , lift 6 inch)	12,13,14 , 15,16

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 Roving Process and operating regions	1a. Identify operating principle of roving process for the given sliver with justification. 1b. Select relevant hanks for the given draw frame silver with justification. 1c. Describe with sketches the given mechanism/machine part of operating region. 1d. Compare the given top roller weighing methods on given parameters. 1e. Explain with sketches the working of the given mechanism used in the winding of bobbins.	1.1 Roving Process: purpose, operating principle, passage of material through roving frame, select different hanks of draw frame slivers 1.2 Operating region: creel, drafting arrangement, pressure on top roller, aprons, condenser, spindle and flyer. 1.3 Winding of bobbin: lifter motion, building mechanism, cone drum.
Unit– II Monitoring	2a. Explain with sketches the importance and working of the given	2.1 Monitoring devices: need, sliver stop motion, roving stop

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Devices and Automations in roving	monitoring device in roving frame 2b. Describe with sketches inspection process of the blower condition in roving frame 2c. Explain with sketches the working of the given change places in roving frame. 2d. Estimate the production in kg/shift of roving frame for given data.	motion, blower 2.2 Automation: doffing, piecing, cleaning, transport of roving bobbin, treading of roving bobbin, removal of waste 2.3 Different change places(pinion) in roving frame :twist change gear, draft change gear, break draft change gear 2.4 Calculation: draft, draft constant, twist, twist constant and production.
Unit– III Ring frame Process and Operating Regions	3a. Describe with sketches the given spacer used in ring frame 3b. Describe with sketches the given mechanism/machine part of operating region 3c. Explain with sketches the working of the given spindle drive and its classification. 3d. Explain with sketches the working of the given drive	3.1 Ring frame: operating principle. Passage of material through ring frame machine. 3.2 Operating region: the creel, Drafting arrangement, cradle, spacer, apron, lappet, baloon control ring, bolster 3.3 Spinning trangle, compact spinning, Spindle: spindle drive-tape drives, tangential belt drive, direct drive
Unit-IV Ring and Travellers	4a. Select the suitable ring and traveller to produce given type of yarn with justification. 4b. Explain with sketches the functioning of the given type of ring and its classification 4c. Explain with sketches the functioning of the given type of traveller. 4d. Explain the meaning of given notification for a traveller	4.1 Ring: types-single sided double sided and antiwedge ring, ring material, mounting of ring. 4.2 Traveller: functions, classification ,wire profile, material, mass of the traveller, traveller clearer, traveller number
Unit-V Building and Doffing	5a. Explain with sketches the working of the given type of build. 5b. Describe with sketches the given type of doffing and its merits and limitations compared to other given type of doffing 5c. Describe with sketches the given cause of end breakages and suggest remedies for it. 5d. Describe with sketches the features of the given type of yarn fault and	5.1 Building mechanism, types of build 5.2 Doffing: manual doffing , automatic doffing 5.3 End breaks in ring frame : causes and remedies 5.4 Types of yarn fault. Classmate II fault 5.5 Package faults-Causes and remedies

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	its remedies 5e. Describe with sketches the given type of yarn package fault and its remedies.	
Unit –VI Automation and Monitoring in ring frame	6a. Describe with sketches the functioning of the given change places in ring frame 6b. Select change pinion and twist wheel to produce given type of yarn with justification 6c. Calculate the production in kg/shift of ring frame for given data. 6d. Calculate average count and convert into 40s count from given data.	6.1 Need to automate, possibilities for automation 6.2 Features of modern ring frame 6.3 Monitoring in ring frame. 6.4 Calculation: draft, draft constant, twist, twist constant, production 6.5 Calculation of average count of a mill and conversion to 40s count

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	Roving Process and Operating Regions	12	04	07	07	18
II	Monitoring Devices and Automations in Roving	08	02	04	04	10
III	Ring Frame Process and Operating Regions	10	04	05	05	14
IV	Ring and Travellers	05	02	02	04	08
V	Building and Doffing	05	02	02	04	08
VI	Automation and monitoring in Ring Frame	08	02	05	05	12
	Total	**48**	**16**	**25**	**29**	**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:

    a. Prepare journals based on practical performed in workshop.
    b. Measure yarn evenness for set of yarns.

    c. Give seminar on any relevant topic.

    d. Library and internet survey regarding roving ring frame parameters used for different materials.

    e. Prepare power point presentation or animation for showing building mechanism.

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:

    a. Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.

    b. *'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.

    c. 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).

    d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.

    e. Guide student(s) in undertaking micro-projects.

    f. Use of video animation films to explain concept, Facts and applications.

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 are given here. Similar micro-projects could be added by the concerned faculty:

    a. **Draw frame slivers:** Each batch will collect different draw frame sliver and prepare a card sheet by rearranging sliver in increasing order of its hank. .

    b. **Cotton slivers:** Each batch will collect Card sliver/combed sliver/draw frame and compare them with each other.

    c. **Rove package fault:** Each batch will collect two defective rove packages and take photograph of various package defects and paste on card sheet with description of their causes and possible remedies.

    d. **Building mechanism:** Each batch will collect photographs of different building mechanism and their parts, and paste on card sheet with their names.

    e. **Objectionable faults:** Each batch will collect different yarn faults and categories it according to classimat faults on black card board sheet with description of their causes and possible remedies.

f. **Yarn package fault:** Each batch will collect two defective yarn packages and take photograph of various package defects and paste on card sheet with description of their causes and possible remedies.

g. **Yarn twist and strength:** Each batch will collect ten yarn sample and paste on card sheet rearranging in increasing order of twist and strength level.

h. **Yarn evenness:** Each batch will collect different yarn and test its evenness on evenness tester and record its cv%

i. **Waste in ring frame:** Each batch will collect different types of waste and paste on card sheet with description of their type.

j. **Advances in Yarn Manufacturing;** Each batch will explore the internet and would make a report in advances in manufacturing of yarn (including advances in materials, processes, machines and yarn quality) in different parts of world.

13.   SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Spinning	Lord, P.R	Wood head Publications, india,1970 ISBN: 185573 9771
2	Spinning of Manmade and Blends on cotton spinning	Salhotra. K.R	The Textile Association of India, Ahmedabad, 2016, ISBN:189328 00X
3	Spun Yarn Technology	Eric,Oxtoby	Butterworth's(Publishers) Limited, 1983, ISBN:0408014644
4	Practical guide to ring spinning	Klein, W.	The Textile Institute, Manchenstar, 1987, ISBN: 09000739940
5	A Practical guide to Combing and Drawing, Vol.-3	Klein, W.	The Textile Institute, Manchenstar, 1987, ISBN: 0900739932
6	Spun yarn technology	Eric,oxtoby	Butterworth, Heinemann,2013 ISBN:13:9781483129389
7	Essential element for practical cotton spinning	Pattabhiram, T. K	Somaiya,1972

14.   SUGGESTED SOFTWARE/LEARNING WEBSITES

a. http://textilelearner.blogspot.in/2012/01/simplex-machine-speed-frame-flyer-frame.html

b. http://textilelearner.blogspot.in/2012/05/speed-frame-necessity-of-speed-frame.html

c. http://www.textileschool.com/articles/524/simplex-frame-and-its-parts

d. http://nptel.ac.in/courses/116102038/9

e. http://nptel.ac.in/courses/116102038/10

f. http://nptel.ac.in/courses/116102038/11

g. http://nptel.ac.in/courses/116102038/12

h. http://nptel.ac.in/courses/116102038/13

i. http://nptel.ac.in/courses/116102038/21

j. http://textilelearner.blogspot.in/2013/05/an-overview-of-ring-spinning.html

k. https://textileapex.blogspot.in/2014/01/ring-spinning-definition-object.html