

Program Name : Diploma in Textile Manufacturers
Program Code : TX
Semester : Third
Course Title : Carding and Combing
Course Code : 22365

1. RATIONALE

In ginning and blow room, cotton seeds and heavy impurities are removed even though some impurities remain in the cotton material. Also the fibers are randomly arranged in blow room lap. This affects the quality of yarn, grey fabric and processed fabric. Through this course the diploma engineer will acquire knowledge and skills required to control spinning preparatory processes such as Carding, Combing and Drawing. Carding process improves fiber individualization and removes residual impurities from the cotton fibre. Combing is done for straightening, parallelization, upgrading the quality of cotton fibres and removing short fibres. In drawing process fiber parallelization and improvement in evenness is achieved. This course is designed to prepare the diploma engineer to apply the basic knowledge of carding, drawing and combing processes to solve broad based problems in textile industry.

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 carding machine to form uniform sliver product.

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:

- Use carding machine to individualize the fibres, remove impurities and neps in cotton material.
- Use auto-levelers to produce even quality sliver.
- Use draw frame to produce even sliver.
- Use auto-levelers to control sliver quality of draw frame.
- Use comber lap preparatory to produce even lap sheet.
- Use comber to produce good quality sliver by removing short fibres and hooks.

4. TEACHING AND EXAMINATION SCHEME

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

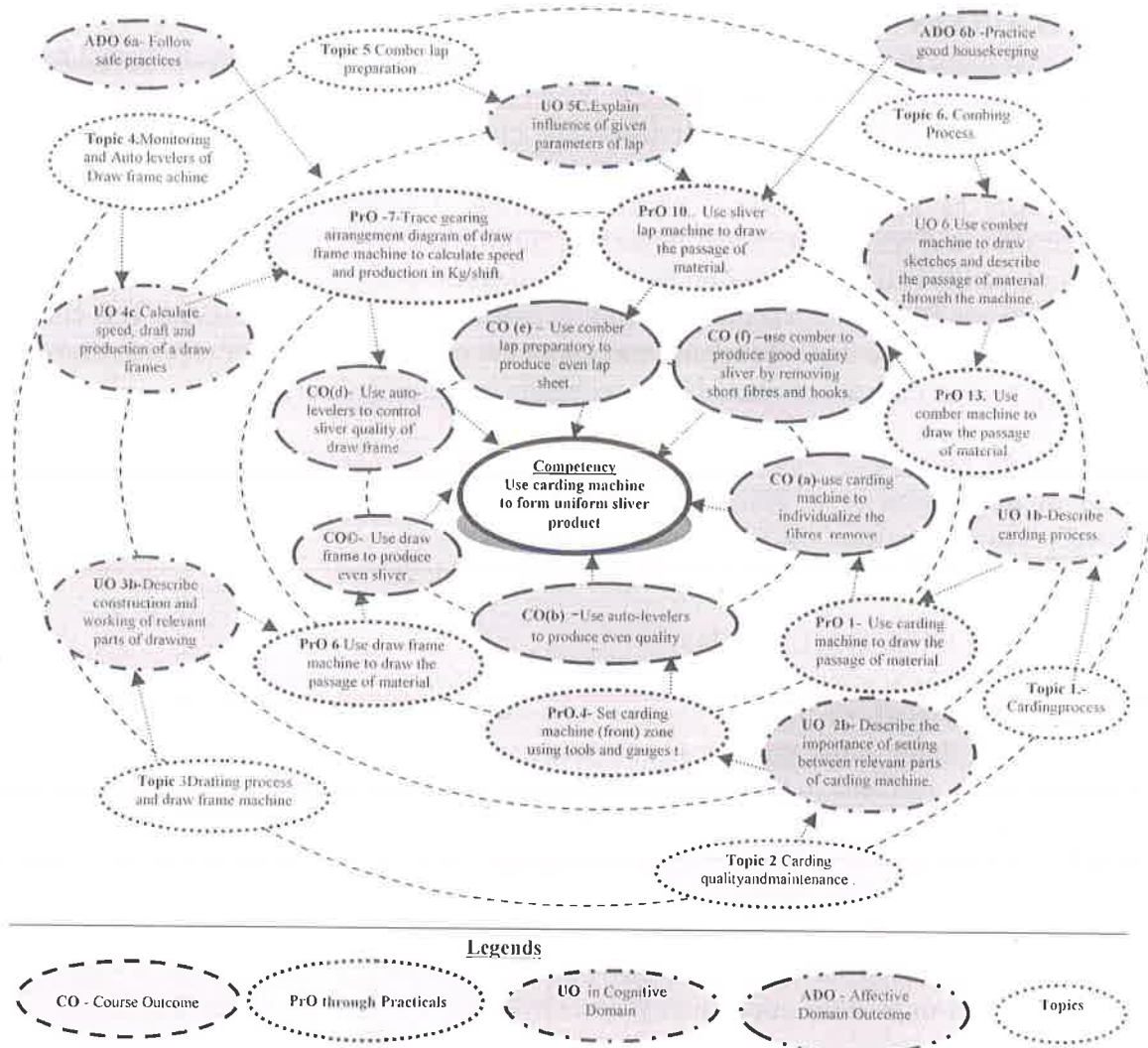


Figure 1 - Course Map

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 carding machine to draw the passage of material.	I	02*
2	Trace gearing arrangement diagram of carding machine to calculate speed and production in Kg/shift.	I	02



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
3	Trace gearing arrangement diagram of carding machine to calculate draft and draft constant.	I	02
4	Set carding machine (front) zone using tools and gauges.	II	02*
5	Set carding machine (back) zone using tools and gauges.	II	02
6	Use draw frame machine to draw the passage of material.	III	02*
7	Trace gearing arrangement diagram of draw frame machine to calculate speed and production in Kg/shift.	IV	02*
8	Trace gearing arrangement diagram of draw frame machine to calculate draft and draft constant.	IV	02
9	Set draw frame machine using tools and gauges.	IV	02
10	Use sliver lap machine to draw the passage of material.	V	02*
11	Trace gearing arrangement diagram of sliver lap machine to calculate speed and production in Kg/shift.	V	02
12	Use ribbon lap machine to draw the passage of material.	V	02
13	Use comber machine to draw the passage of material.	VI	02*
14	Trace gearing arrangement diagram of comber machine to calculate production.	VI	02
15	Set comber machine using tools and gauges. Part - I	VI	02*
16	Set comber machine using tools and gauges. Part - I	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 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:

- a. Follow safety practices.
- b. Practice good housekeeping.
- c. Practice energy conservation.



- d. Demonstrate working as a leader/a team member.
- e. Maintain tools and equipment.
- f. 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	Carding machine (Doffer dia.-27 inch, Cylinder dia.-50 inch. Licker in-dia-9 inch. Feed roller dia.-2inch.) Digital Tachometer (100-5000 rpm), steel ruler, Vernier caliper	1,2,3
2	Leaf gauges-5 thou (5"/1000), 7thou, 10thou, 12thou.	4,5
3	Draw frame, Feeler gauges- 1/32" and 1/25"	6,7,8,9
4	Sliver lap machine, Shell roller dia-12inch. Calender roller dia-5inch.	10,11
5	Ribbon lap machine, Shell roller dia-12inch. Calender roller dia-5inch.	12
6	Comber machine, nips /min-350, feed /nip-1.1", Digital Tachometer (100-5000 rpm), steel ruler	13,14
7	Gauges- Step gauge, distance gauge, bowl gauge	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-1 Carding Process	1a. Describe with sketches the construction and working of the specified parts of carding machine. 1b. Differentiate between feeding devices based on given parameters. 1c. Describe with sketches the relevant zones in carding machine based on given application. 1d. Describe with sketches the process of removing	1.1 Carding process: Purpose, Operating principle 1.2 Operating zones: material feed, feed device, feed device to licker-in(lap feed, chute feed), Licker-in zone, auxiliary carding devices, main cylinder, flats, doffing, detaching. 1.3 Coiling: types, condensing, trumpet, sliver coiling, can changer 1.4 Classification of fiber hooks at card



	<p>impurities from given sample.</p> <p>1e. Describe with sketches the process of fibre to fibre separation from given sample.</p>	
Unit- II Carding quality and maintena nce	<p>2a. Interpret the specifications of given wire clothing.</p> <p>2b. Explain with sketches the principle of given auto leveler</p> <p>2c. Describe with sketches the relevant auto leveler measuring and monitoring devices.</p> <p>2d. Describe with sketches the given method of card clothing maintenance.</p> <p>2e. Explain importance of the specified carding related devices.</p>	<p>2.1 Card Clothing-classification, flexible clothing, semi-rigid clothing, metallic clothing, Choice of clothing</p> <p>2.2 Maintenance– stripping, burnishing and grinding</p> <p>2.3 Auto leveler - Basics, classification, principle of short, medium and long term auto leveling, Auto leveling Equipment-Function of Auto leveler at card, Auto level measuring and monitoring devices.</p> <p>2.4 Card settings and their effect on sliver quality</p> <p>2.5 Carding Machine Calculations - speeds, draft, production and hank of sliver.</p> <p>2.6 Modern developments in carding- Comb bar, deflector blade, Stationary flats (Pre and post comb segments), Doffing devices – apron, roller doffing.</p> <p>2.7 Features of high production card.</p>
Unit –III Drafting process and draw frame machine	<p>3a. Explain with sketches the construction and working of the specified parts of drawing machine.</p> <p>3b. Describe with sketches the the given drafting arrangement</p> <p>3c. Describe with sketches the maintenance procedure for the given type of rollers.</p> <p>3d. Describe with sketches the the given draw frame.</p>	<p>3.1 Draw Frame: Purpose, operating principle, Attenuation (Draft), roller drafting, distribution of draft, Shirley drafting principle, principles of doubling, factor affecting the draft based on fibre material. Passage of material through draw frame.</p> <p>3.2 Operating devices: Creel, Drafting arrangement, drafting rollers-top rollers, bottom rollers, cots buffing, roller setting, roller weighing systems, roller clearers, suction system.</p> <p>3.3 Drafting systems used on draw frame 3/4, 3/3, 4/3, 5/4, pressure bar.</p>
Unit –IV Monitori ng and Auto leveling of Draw frame	<p>4a. Describe with sketches the specified method of auto levelers.</p> <p>4b. Describe application of the specified monitoring devices on draw frame.</p> <p>4c. Explain the specified defects in drawn sliver with their causes and remedies.</p>	<p>4.1 Auto-leveler in draw frame.</p> <p>4.2 Integrated monitoring system (sliver data)</p> <p>4.3 Draw frame calculations: draft, production and waste,</p> <p>4.4 Draw frame: Defects, causes and remedies, Features of high production draw frame.</p>



	4d. Calculate the speed, draft and production of a draw frame for the given situation.	
Unit –V Comber lap preparati on	5a. Describe with sketches the construction and working of the given machines. 5b. Explain influence of the given parameters of lap preparation on combing process. 5c. Explain the specified defects in comb sliver with their causes and remedies 5d. Calculate the production in Kg/shift of given combing preparatory machine with given data.	5.1 Comber: purpose. 5.2 Lap preparation: Effects on combing- effect of pre comb draft on comber performance, parallelization of fibre in the sheet, sheet thickness, evenness of lap sheet, disposition of the hooks. 5.3 Lap preparing machines- sliver lap, ribbon lap, lap former 5.4 Causes of defective production and their remedies. 5.5 Calculation related to production and draft of sliver lap and ribbon Lap
Unit –VI Combing Process	6a. Describe with sketches the sequence of operation of the given comber. 6b. Explain importance of index wheel for the given combing machine 6c. Calculate the production in Kg/shift and draft of the given combing machine with given data. 6d. Compare the features of the given types of feed.	6.1 Comber- Elements, working, Types, 6.2 Technology of combing- parameters influencing the combing operation, influence of the combing on quality, Sequence of operation of rectilinear comber; Defects, causes and remedies of comber machine, features of modern comber. Types of feed- forward feed, backward feed. 6.3 Index wheel timing and setting of comber. Influence of machine component and setting on combing performance. 6.4 Calculations related to draft, noil and production.

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	Carding Process	12	02	04	06	12
II	Carding quality and maintenance.	12	04	02	06	12
III	Drafting process and draw frame machine	10	02	02	04	08
IV	Monitoring and auto- levelers of draw frame machine	06	02	02	06	10
V	Comber lap preparation.	08	02	02	06	10
VI	Combing Process		04	04	10	18



Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Total		64	16	16	38	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:

- Prepare journals based on practical's performed in laboratory.
- Measure sliver evenness specification.
- Give seminar on any relevant topic.
- Library survey regarding modern features of carding, drawing, comber preparatory and comber machine use in different industries.
- Prepare power point presentation for showing principles of Carding, Drawing and combing.

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 the principle of Carding Drawing and combing
- Give micro projects to students

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. Carding Process:

- i. Collect different card wires and draw diagrams of the same.
- ii. Prepare chart for wire point specification of licker-in, cylinder, doffer and flat tops of different manufacturers with trade name.
- iii. Collect wastes at different parts and enlist type of waste and calculate its percentage
- iv. Refer monograph published by different research association and prepare chart for specification of waste extracted at different for different quality of cotton.

b. Carding quality and maintenance.

Draw line diagram of various autoleveler measuring devices and Enlist merits and demerits of each system.

c. Drafting process and draw frame machine:

Draw line diagram of various drafting systems and Enlist merits and demerits of each system.

d. Monitoring and Auto-levelers of Draw frame process.

Collect photographs and specification of various auto leveler and Prepare booklet..

e. Comber lap preparation:

Collect photographs and specification of various combing preparatory machines and Prepare booklet.

f. Combing Process:

Prepare index wheel timing in tabular form and draw a line diagram of combing cycle.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	A Practical guide to Opening and Carding, Vol.-	Klein, W.	The Textile Institute,Manchenstar,1987 ISBN: 0900739924
2	A Practical guide to Combing and Drawing,	Klein, W.	The Textile Institute,Manchenstar,1987 ISBN: 0900739932
3	Spinning	Lord, P.R	Wood head publications, India,1970, ISBN: 185573 9771
4	Spinning of Manmade and Blends on cotton spinning	Salhotra, K.R	The Textile Association of India, Ahmedabad, 2016 , ISBN:18932800X
5	Spun Yarn Technology	Eric,Oxtoby	Butterworth's (Publishers) Limited, 1983, ISBN:0408014644

14. SUGGESTED SOFTWARE/LEARNING WEBSITES

- a. www.nptl.comhttp://www.textileschool.com/articles/109/blow-room-functions
- b. www.textilelearner.blogspot.in/2011/07/basic-operations-in-blowroom_485.html
- c. www.textilelearner.blogspot.in/2011/03/blowroom-objects-of-blow-room-basic_2485.html



- d. [www.rieter.com/cz/rikipedia/articles/combingand drawing-spinning/applications-engineering/preparation-of-raw-material/the-processing-stages/blowroom/](http://www.rieter.com/cz/rikipedia/articles/combingand%20drawing-spinning/applications-engineering/preparation-of-raw-material/the-processing-stages/blowroom/)
- e. www.youtube.com/watch?v=IDGmXssFa6s
- f. www.en.wikipedia.org/wiki/Cotton_gin
- g. www.s-media-cache-ak0.pinimg.com/564x/b8/76/b6/b876b60703a1b40138e5b800dd7212e2.jpg
- h. www.gluedideas.com/Encyclopedia-Britannica-Volume-6-Part-2-Colebrooke-Damascius/Cotton-Ginning-Machinery.html
- i. www.textilelearner.blogspot.in/2011/08/what-is-ginning-cotton-ginning-types-of_8829.html
- j. www.textilefashionstudy.com/what-is-textile-fiber-classifications-of-textile-fiber/
- k. www.cms.gcg11.ac.in/attachments/article/87/CLASSIFICATION%20OF%20YARN.pdf
- l. www.nptel.ac.in/courses/116102034/1

