Program Name : **Diploma in Textile Technology**

Program Code : **TC**

Semester : **Sixth**

Course Title : **Textile Process Planning and Management**

Course Code : **22670**

1. RATIONALE

In textile processing industry various chemical processes are carried out to convert gray fabric in to finished fabric. The flow of textile material in these processes is important and depends on the layout of machines. Proper utilization of space and machine gives optimum performance of various machines in the section. At the same time proper utilization of water, energy and chemicals reduces the cost of production. Diploma engineers should have knowledge about production norms of various machines, water, energy and chemical consumption and their calculations. This course is developed in such a way that basic concepts and principles of textile process management will help the diploma engineer to get maximum production by proper utilization of space and machine. This will further help them to solve broad based problems in the textile finishing processes.

2. COMPETENCY

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

- **Undertake textile processing operation using relevant management principles.**

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) Develop layout plan for various textile processing units.
b) Calculate machine production parameters for the given textile processing machine.
c) Calculate water consumption in the given textile process and machine.
d) Calculate energy consumption in the given textile process and machine.
e) Calculate chemical consumption in the given textile process and machine.
f) Select relevant material handling equipment considering safety measure in the textile processing.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory							Practical					
L	T	P		Paper Hrs.	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	--	--	--	--	--	--

(*): 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.

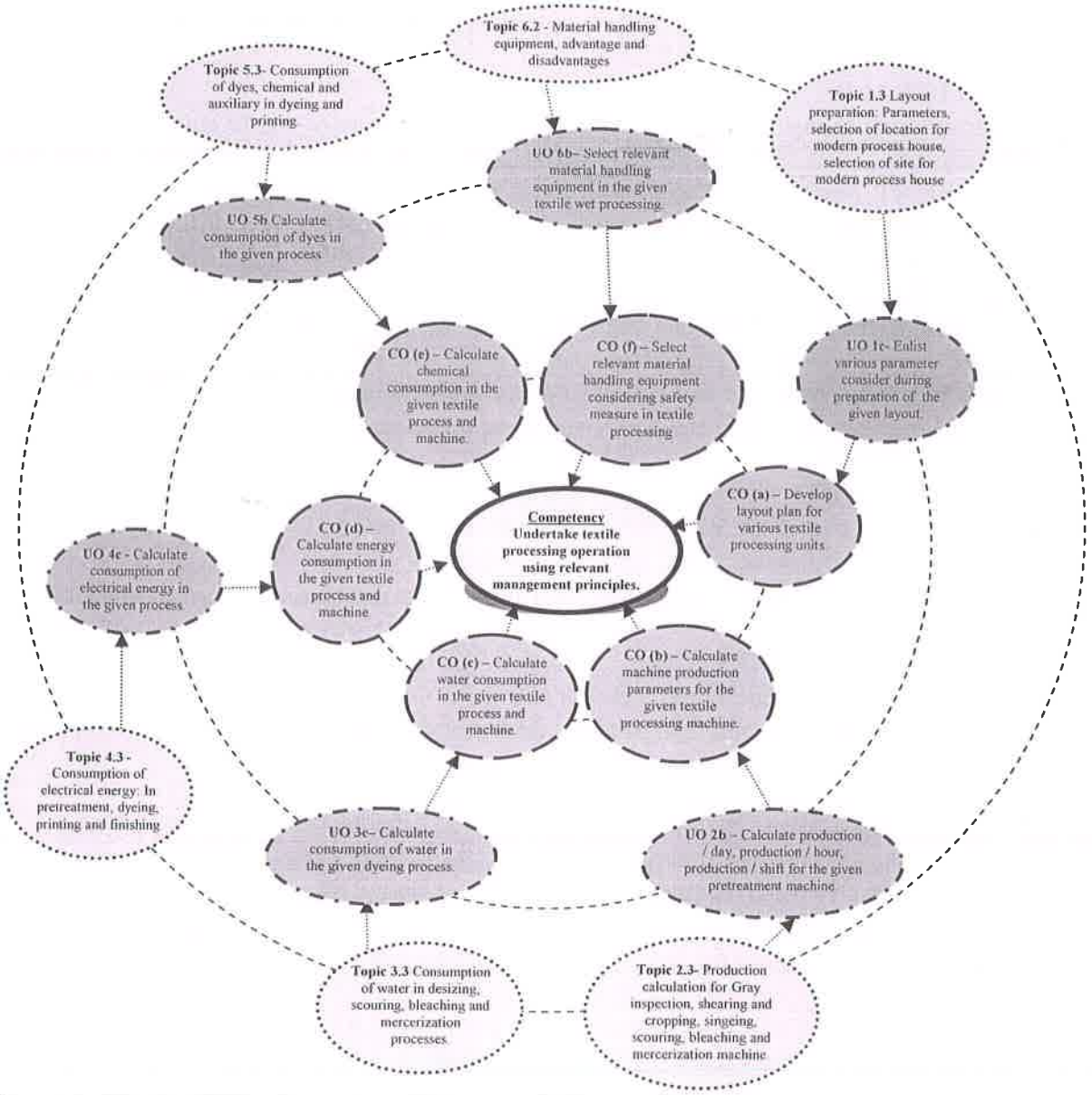

Figure 1 - Course Map

6. SUGGESTED TUTORIAL EXERCISES

The tutorials in this section are assessed in the student for the attainment of the competency:

S. No.	TUTORIALS	Unit No.	Approx. Hrs. Required
1	Develop layout plan for the given package dyeing unit.	I	02*
2	Develop layout plan for the given conventional fabric processing unit.	I	02*

S. No.	TUTORIALS	Unit No.	Approx. Hrs. Required
3	Develop layout plan for the given modern fabric processing dyeing unit.	I	02*
4	Calculate production parameters for the given process in bleaching department	II	02*
5	Calculate production parameters for the given process in dyeing department	II	02*
6	Calculate production parameters for the given process in printing department	II	02
7	Calculate production parameters for the given process in finishing department	II	02
8	Determine water consumption for the given process.	III	02*
9	Determine water consumption for the given machine.	III	02*
10	Determine water consumption for the given department.	III	02
11	Determine electrical energy consumption for the given machine.	IV	02*
12	Determine steam consumption for given processes in textile processing.	IV	02*
13	Determine energy required to dry the given fabric.	IV	02
14	Calculate the cost of chemicals and auxiliaries for the given pretreatment process.	V	02*
15	Calculate the cost of dyes in the given dyeing process.	V	02*
16	Select material handling equipment for the given textile process.	VI	02
17	Identify department-wise lighting needs and consumption for the given textile process.	VI	02
18	Select relevant safety equipment for the given textile machine.	VI	02
	Total		**36**

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. Practice energy conservation.
d. Work as a leader/a team member..
a. 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
- 'Organization Level' in 2nd year
- 'Characterisation Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Drawing board. (2ft * 2 ft.)	1-3

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 Construction, Planning and Lay Out	1a. Describe the parameter to be considered during design of the given type of process house. 1b. Explain various features of the given storage building. 1c. List various parameters to be considered during preparation of the given layout. 1d. Describe parameter consider during selection of the given location. 1e. Describe parameter consider during selection of the given site.	1.1 Plan for setting up of a modern process house 1.2 Construction: - Single storage building, multi storage building features and layout of modern process house. 1.3 Layout preparation: Parameters, selection of location for modern process house, selection of site for modern process house 1.4 Layout: Advantages and disadvantages
Unit– II Production calculation	2a. Describe methodology to calculate production in the given textile wet processing. 2b. Calculate production / day, production / hour, production / shift for the given pretreatment machine. 2c. Calculate production / day production / hour, production / shift for the given dyeing machine. 2d. Calculate production / day production / hour, production / shift for the given printing machine.	2.1 Method to calculate production in textile wet processing 2.2 Production / hour, Production / shift, Production / day. 2.3 Production calculation for Gray inspection, shearing and cropping, singeing, scouring, bleaching and mercerization machine. 2.4 Production calculation for jigger, jet, soft flow, winch, PDPS, CPB, E-Control.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	2e. Calculate production / day production / hour, production / shift for the given finishing machine.	2.5 Production calculation for flat bed and rotary screen-printing machine. 2.6 Production calculation for stenter, calendar, drying range and sanforising machine
Unit-III Water consumption	3a. Describe with flow chart method to get water consumption in the given textile wet processing. 3b. Calculate consumption of water in the given dyeing process. 3c. Calculate consumption of water in the given printing process. 3d. Calculate consumption of water in the given finishing process. 3e. Describe the specified method to conserve and reuse water.	3.1 Water quality norms for textile wet processing. 3.2 Consumption of water: Calculation method. 3.3 Consumption of water in desizing, scouring, bleaching and mercerization processes. 3.4 Consumption of water in dyeing. 3.5 Consumption of water in printing. 3.6 Consumption of water in finishing processes. 3.7 Conservation and reuse of water in process house.
Unit –IV Energy consumption	4a. Describe properties of the specified fuel used in textile wet processing. 4b. Describe with flow chart method to get energy consumption in the given textile wet processing. 4c. Calculate consumption of electrical energy in the given process. 4d. Calculate consumption of steam energy in the given process.	4.1 Fuels: Type, advantages and disadvantages. 4.2 Calculation of electrical energy: Methods 4.3 Consumption of electrical energy: In pretreatment, dyeing, printing and finishing. 4.4 Consumption of steam energy: In pretreatment, dyeing, printing and finishing.
Unit-V Chemical consumption	5a. Explain with flow chart the steps to calculate chemical consumption in the given textile wet processing. 5b. Calculate consumption of dyes in the given process. 5c. Calculate consumption of chemical in the given process. 5d. Calculate consumption of auxiliary in the given process.	5.1 Calculation of dyes, chemical, and auxiliary 5.2 Consumption of chemical and auxiliary in pretreatment, cost calculation. 5.3 Consumption of dyes, chemical and auxiliary in dyeing and printing. 5.4 Consumption of chemical and auxiliary in finishing.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit-VI Material handling and safety	6a. Describe importance of lighting in the specified textile wet processing 6b. Select relevant material handling equipment in the given textile wet processing with justification. 6c. Identify probable accident-prone areas, types and remedies in given type of textile processing. 6d. Describe relevant safety precaution in the given type of textile processing.	6.1 Light- Importance, advantages, disadvantages, norms at work place 6.2 Material handling equipment- advantage and disadvantages. 6.3 Accidents- Type, causes, remedy. 6.4 Safety- Electrical, Chemical handling.

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	Construction, Planning and Lay Out	5	2	2	4	8
II	Production calculation	10	2	4	8	14
III	Water consumption	10	2	4	8	14
IV	Energy consumption	10	2	4	8	14
V	Chemical consumption	8	2	4	6	12
VI	Material handling and safety	5	2	2	4	8
Total		**48**	**12**	**20**	**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:

a) Suggest relevant location and site for setting of new textile processing unit with their parameters.
b) Visit a local textile processing Industry and draw its layout. Present it in report.
c) Visit to local industry and enlist machines installed there with their water consumption. Suggest method to save water.
d) Collect the photographs of various material handling equipments used in textile processing industry. Present it in report.
e) Prepare chart/s of safety equipment used in textile processing industry.
f) Prepare cost chart of chemical used in local textile processing industry.

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 are relatively simpler or descriptive in nature 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) Demonstrate students thoroughly before they start doing the practice.
g) Encourage students to refer different websites to have deeper understanding of the subject.
h) Observe continuously and monitor the performance of students in Lab.

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 is 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. The concerned faculty could add similar micro-projects:

a) Visit a local Industry. Analyze the fabric flow. Draw new plant layout with minimum time delay.
b) Visit a local Industry. Prepare a chart of production parameter for bleaching, dyeing, printing and finishing department.
c) Visit to local industry and prepare a flow chart of material for a relevant industry. Suggest new flow chart for time save with justification
d) Visit to local industry and prepare a chart of various sources of water used for industry.
e) Visit to local industry and prepare a chart of various energy sources for textile processing industry.
f) Visit to local industry and prepare a chart for chemical used in textile with their cost.
g) Visit to local industry and collect the photograph of various materials handling equipment used in textile processing industry. Suggest any alternative machine with justification.
h) Visit to local industry and identify probable accident-prone areas, types and remedies in textile wet processing Prepare a report on it and present.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Dye House Management Manual	Park James; Shore John	Multi-Tech Publishing Co. Mumbai, 2000, ISBN: 9788187070085
2	Plant Layout and Material Handling	Meyers Fred E	Regents/Prentice Hall, New Jersey, 1993 ISBN: 9780130134752
3	Management of Textile Industry	Dudeja V.D.	Textile Trade Press, 1981 ASIN: B0007BETCW

14. SOFTWARE/LEARNING WEBSITES

a) mrunal.org/2013/07/geography-location-factors-cotton-textile-osaka-manchester-lancashire-mumbai-ahmedabad-shanghai.html
b) www.geographynotes.com/articles/selection-of-location-for-industries-8-factors/276
c) www.yourarticlelibrary.com/industries/location-selection/factors-affecting-site-location-of-an-industrial-unit-i-primary-and-ii-secondary-site-selection/26167
d) apparelcosting.blogspot.com/2017/05/dyeing-cost-calculation-method-textile.html
e) www.iiste.org/Journals/index.php/CMR/article/viewFile/5468/5588
f) textilelearner.blogspot.com/2014/04/water-consumption-in-textile-industry.html
g) textilelearner.blogspot.com/2012/07/some-important-parameters-of-water-for.html
h) onlinelibrary.wiley.com/doi/pdf/10.1111/j.1478-4408.1971.tb03013.x
i) www.tex.tuiasi.ro/biblioteca/carti/Articole/Efficient%20Water%20Utilisation%20in%20Textile%20Wet%20Processing.pdf
j) www.cellulosechemtechnol.ro/pdf/CCT4-6-2009/P.189-192.pdf
k) www.researchgate.net/publication/223060218_Electric_energy_consumption_in_the_cotton_textile_processing_stages
l) www.interscience.in/IJPSOEM_Vol2Iss1-2/45-49.pdf
m) www.omicsonline.org/open-access/a-review-on-energy-management-in-textile-industry.pdf
n) fashion2apparel.blogspot.com/2017/04/textile-chemicals-auxiliaries.html
o) www.indiamart.com/laxmisteel-products/handling-equipments.html
p) www.hse.gov.uk/textiles/index.htm