Program Name	: **Diploma in Textile Manufacturers**
Program Code	: **TX**
Semester	: **Fourth**
Course Title	: **CAD For Textile**
Course Code	: **22044**

1.   RATIONALE

Idea about artistic designs requires skill to generate. They need a direction to express, design principle, composition and various colour theory help in getting students innovative designs in their mind. their creative ideas of designs has a potential to capture market value. there is basic difference between artistic design and textile designs, textile designs must be technically viable and aesthetically beautiful. Textile designs decide the quality as well as cost of fabric.

Microsoft window's based CAD system for textile design helps students, designers and manufacturers to deliver superior fashion products in a more timely and efficient manner to the market. The software has been devised as a natural extension of a designers and designing process will develop practical skills to generate innovative textile designs.

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 Computer Aided Design software to produce textile designs**

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.   Apply various principles of designs.
b.   Apply theories of color, modified color, color harmony and various composition of design for end use applications.
c.   Create point paper design for dobby and jacquard.
d.   Use various modules of CAD software to generate data sheet and fabric simulation.

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
1	--	2	3	--	--	--	--	--	--	--	25@	10	25~	10	50	20

*(^{I}): For the **practical only courses,** the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e. 30 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e. 20 marks). This is designed to facilitate attainment of COs holistically, as there is no theory ESE.*
***Legends: L-**Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit*
***ESE** - End Semester Examination; **PA** - Progressive Assessment, #: No theory paper*

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.
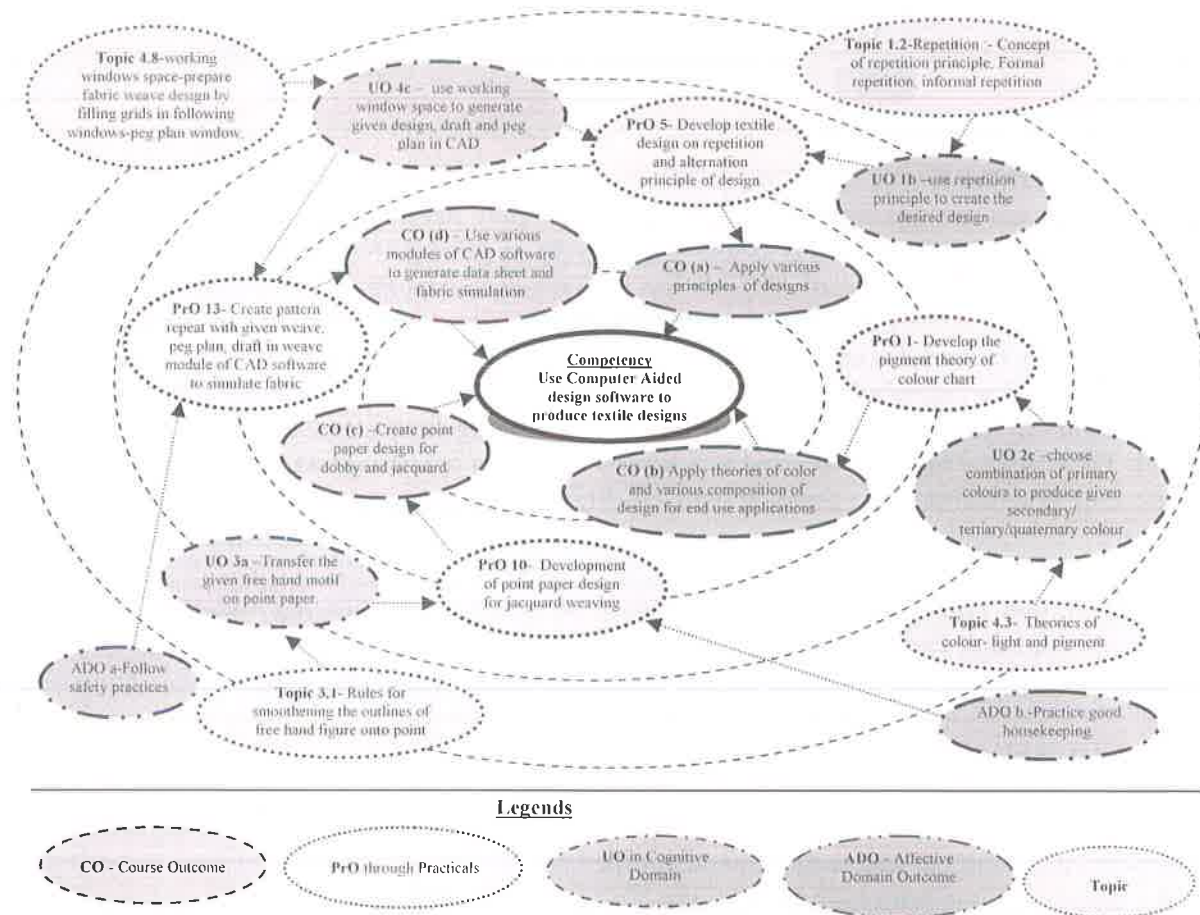

Figure 1 - Course Map

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:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Develop the pigment theory colour chart.	I	02*
2	Develop the light theory colour chart	I	02
3	Develop the decorative, natural, geometrical motif for textile design.	I	02*
4	Develop the colour modification chart	I	02
5	Develop textile design with the help of designing principles -Principle of Repetitions and alternation on pint paper	I	02*
6	Develop textile design with the help of Principle of Grade, Harmony, Balance, Contrast on pint paper.	II	02*
7	Develop Composition of textile design by Drop base – half drop or full drop on pint paper	II	02
8	Develop Composition of textile design by Diamond base, Ogee base, Sateen base on pint paper.	III	02*
9	Development of point paper design for dobby weaving	III	02*
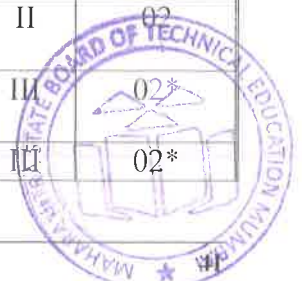
Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
10	Development of point paper design for jacquard weaving	IV	02*
11	Insert given design, draft and peg plan in weaving machine display	IV	02
12	Create basic weave design in CAD software with given fabric constructional parameters (EPI. PPI, Warp count. Weft Count. Denting order. reed space) and develop data sheet	V	02*
13	Create pattern repeat with given weave, peg plan, draft in weave module of CAD software to simulate real fabric	V	02*
14	Create warp color pattern. weft color pattern to produce simple colour and weave effect in CAD		02*
15	Create jacquard design by inserting given point paper scale, weave pattern in CAD	V	02
16	Develop jacquard pattern cards using card punching machine for given design .	V	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 %
a.	Preparation of experimental set up	10
b.	Operation performance	40
c.	Safety measures	10
d.	Observations	10
e.	Conclusion	20
f.	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
- '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	Drawing Sheet (A4 Size)	1 to 8
2	Pencil- HB	1 to 8
3	Tracing Paper- Gateway Quality	1 to 8
4	Poster Colour	1 to 8
5	Colouring Brush- Round (0,2,4), Flat (1/2 Inch)	1 to 8
6	Bow Pen	1 to 8
7	Bow Compass	1 to 8
8	Point Paper (Inch)	9 to 10
9	Sketch Pen Set	9 to 10
10	CAD (Textile Designing) Software	11 to 15
11	Computer System (2GB RAM/Core I3/ Windows) with Digitiser, Colour Monitor	11 to 15
12	Colour Printer	11 to 15
13	Card Punching Machine	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 Principles of elementary Design	1a. Identify the relevant principle of design in the given sample 1b. Use repetition principle to create the desired design 1c. use harmony, gradation and contrast principle to create desired design 1d. create design using given combination of principles of design.	1.1 Elements of art design applied to textile 1.2 Repetition :- Concept of repetition principle, Formal repetition, informal repetition 1.3 Alternation:- Concept of alternation principle, Colour alternation, Size alternation, Direction alternation, Shape alternation. 1.4 Harmony :- Concept & attribute, Pure harmony, Discord harmony 1.5 Gradation :- Concept of gradation, 1.6 Contrast :- Concept of contrast, Concept of hue, Concept of tone 1.7 Balance :- Concept of balance, Formal balance, Informal balance 1.8 Dominance :- Concept of dominance principle

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit– II Colour theories and Design composition	2a. Choose combination of primary colours to produce given secondary/ tertiary/quaternary colour. 2b. Identify various shades/tones/tints of colour for given textile design. 2c. select various colour harmonies based on given end use (e.g. women's ware, men's ware, office ware, kid's ware) 2d. create ornamented design with given design composition	2.1 Theories of colour- light and pigment 2.2 Colour Modification - Development of tints, tones and shades 2.3 Colour Harmonies: Achromatic, Monochromatic, Analogous, Polychromatic colour harmony. 2.4 design composition: Rectangle base, Drop base – half drop or full drop, Diamond base, Ogee base, Sateen base etc
Unit-III Dobby and jacquard design	3a. Transfer the given free hand motif on point paper 3b. select a weave for given motif to replicate tiny details (light and dark shade areas)	3.1 Rules for smoothening the outlines of free hand figure onto point paper 3.2 development of motif with figure shaded weaves.
Unit –IV CAD in Textile Designing	4a. Identify various tools and symbols used in CAD software 4b. apply given fabric constriction parameters to develop various structural and aesthetic effect. 4c. use working window space to generate given design, draft and peg plan in CAD. 4d. create given colour and weave effect (stripe, checks, hairline, birds eye, etc) by using various tools in CAD 4e. generate data sheet of given weave design.	4.1 introduction to CAD - concept of CAD, Use of CAD in fabric weave designing, comparison of manual and CAD system, computer abbreviations and symbols used in CAD systems . 4.2 Functions of tools used in CAD Grid option tool- preparation of grid scale based on design proportion 4.3 fabric construction tool- entering values of fabric parameters like EPI, PPI, Reed space, selvedge dents etc 4.4 warp and weft pattern tool, specify the data of warp and weft pattern in textual form 4.5 Repeat tool- specify pattern repeat e.g no. of ends in warp pattern, weft pattern 4.6 colour palette tool-specifying colors of warp and weft threads 4.7 weave palette tool- import the weave from preset weave library also allow to create own weave 4.8 working windows space-prepare fabric weave design by filling grids in following windows-peg plan window, design graph window, draft window.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		denting window 4.9 simulation and report generation- simulate real life fabric effects and data sheet

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

-Not Applicable-

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. Visit any jacquard/dobby weaving machine unit, collect samples/ photographic evidences (if possible) and identify principles of design, colour modification or base composition
b. Write report on CAD software used in textile industry.
c. Library / Internet survey of various colour and weave effects in fabric
d. collect CAD data sheets by visiting various weaving units
e. Guide student(s) in undertaking micro-projects.
f. Prepare power point presentation on "Application of fabric designs in fashion garments using fashion studio software"

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 colour palette to develop sense colour harmony.
g. Use CAD and develop jacquard designs
h. Replicate given fabric swatch into CAD.

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. **Principles of design:** Prepare catalogue of 20 samples (Images/fabric swatches) that represents various principles of designs

b. **Colour and weave effect :** Prepare 6- CAD designs by altering sequence of warp and weft colour (keeping same base weave e.g. Twill)

c. **colour harmony:** Prepare catalogue of 5 samples (Images/samples) that represents colour harmony from each category mention below.
   i.   kid's ware
   ii. women's ware
   iii. party ware
   iv. home decor (furniture cloths, blinds etc)

d. **CAD in textile designing:** Prepare power point presentation on each module / tools used in software.

e. Prepare Ten- CAD Data sheet for different designs using various tool of CAD software and print their respective simulation

f. choose 3- different colour and prepare colour scale (tints, tones and shades) also develop gray scale

g. develop designs like twill, sateen, honeycomb, huck-a-back, satin on loom

13.   SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Watson's Textile Design and Colour- Elementary Weaves and Figured Fabrics	Grosicki, Z	Woodhead Publishing 1975, e-ISBN 9781782420088
2	Handbook of Textile Design	Jacquie Wilson	Woodhead Publishing 2001, e-ISBN 9781855737532
3	Watson's Advanced Textile Design- Compound Woven Structures	Grosicki, Z	Woodhead Publishing 1977, e-ISBN 9781845698522
4	Colour Design- Theories and Applications	Best, Janet	Woodhead Publishing 2017, e-ISBN: 9780081018897
5	CAD in Clothing and Textiles: A Collection of Expert Views	Aldrich, Winifred	Wiley, 1994; e-ISBN : 9780632038930

14. **SUGGESTED SOFTWARE/LEARNING WEBSITES**
   a. https://www.slideshare.net/sandeepmittal62/development-of-jacquard-design-through-computer-aided-design-cad-weaving-2484259www.scilab.org/scilab
   b. http://textilecentre.blogspot.com/2014/01/cad-it-in-textile_9126.html?showcomment=1389446717727www.learnerstv.com/free-engineering
   c. https://www.ijcrar.com/vol-2-6/Ashis%20Mitra.pdf
   d. http://www.fibre2fashion.com/industry-article/5085/computer-aided
   e. https://www.textronic.com/blanket-management.html
   f. http://www.arahne.eu/pdf/aweave-EN.pdf