

Programme Name: Diploma in Textile Technology/Diploma in Knitting Technology

Programme Code : DTT/DKT

Semester : SECOND

Course : Fundamentals of Wet Processing

Course Code : T233203

I RATIONALE:

Diploma engineers have to work at various levels in textile industry as shift supervisor to marketing head. To solve the textile manufacturing related problems, they should have a basic knowledge of each stage of textile production starting from fibre production up to garment manufacturing. This course develops necessary skills in using the chemicals which are used during pre-treatments process for improving absorbency and whiteness of fabrics. This course also gives the basic knowledge about dyeing, printing and finishing processes of textile which improves the aesthetic value of textile substrate.

II INDUSTRY/EMPLOYER EXPECTED OUTCOME

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 chemical wet processing in textile manufacturing.”

III COURSE LEVEL LEARNING OUTCOMES (CO'S)

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:

(CO 1) Use principles of pre-treatment of fabrics in textile manufacturing

(CO 2) Use relevant methods for bleaching treatments of fabrics.

(CO 3) Use relevant method for dyeing of textile fabrics fabrics.

(CO 4) Use basic methods of printing of textiles fabrics

(CO 5) Choose relevant finishing process according to the end uses.

(CO 6) Select relevant evaluation of fastness properties and fibre identification methods.

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Code	Course Title	Course Category	Learning Scheme					Credits	Assessment Scheme										Total Marks	
			Actual Contact Hrs/week			SLH	NLH		Paper Duration (hrs)	Theory				Based on LL and TSL				Based on SL		
			CL	T L	L L					FA-TH	SA-TH	Total		Practical		SLA				
						Max	Min					Max	Min	Max	Min		Max	Min		
T233203	FUNDAMENTALS OF WET PROCESSING	DS E	2	-	3	1	6	3	3	30	70	100	40	25	10	25	10	25	10	175

Total IKS hours for semester: 02 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. * Self-learning hours shall not be reflected in the Time Table.
6. * Self-learning includes micro project/ assignment/ other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION I			
1	<p>TLO 1.1 introduction to wet processing</p> <p>TLO 1.2 Describe with sketches the features of the given system</p> <p>TLO 1.3 Describe with sketches the procedure to carry out the given type of desizing.</p> <p>TLO 1.4 Describe the scouring process for textile fabrics</p> <p>TLO 1.5 Describe with sketches the procedure to carry out given type of Scouring with machines.</p> <p>TLO 1.6 Explain the importance of mercerisation process.</p>	<p>Unit – I Basics of Pretreatments</p> <p>1.1 Process flow chart for wet processing of textiles, Grey inspection process</p> <p>1.2 Shearing and cropping process: Objective and process</p> <p>1.3 Singeing process and gas singeing machine.</p> <p>1.4 Desizing process: Acid desizing, enzyme desizing, Batch wise and Continuous process of desizing.</p> <p>1.5 Scouring process: vertical pressure kier and J-box system</p> <p>1.6 Mercerization: factors affecting the process of mercerization, Machine used for mercerization.</p>	Lectures, Presentations, Assignments, Practical, YouTube simulation.
2.	<p>TLO 2.1 Explain with sketches the procedure for bleaching of the given type of fibre.</p> <p>TLO 2.2 Explain with sketches the procedure for continuous processing of the given type of blend</p> <p>TLO 2.3 Explain with sketches the Batch wise bleaching process</p>	<p>Unit– II Bleaching of Textile fibres</p> <p>2.1 objective and importance of bleaching process</p> <p>2.2 Bleaching process with sodium chlorite, sodium hypochlorite and H₂O₂ bleaching.</p> <p>2,2Batch wise and continuous methods of bleaching</p>	Lectures, Presentations, Assignments, Practical, YouTube simulation.

	TLO 2.4 Explain the process parameters for bleaching of cellulose and blends TLO 2.5 Suggest the method of evaluation of bleached fabric	2.3 Machines used for bleaching: Jiggers, winch, soft flow, continuous bleaching range. 2.4 Bleaching of cellulose and blends 2.5 Evaluation of bleaching efficiency of bleached fabrics.	
3.	TLO 3.1 Explain the principle of dyeing TLO 3.2 Describe with sketches for Dyeing of given type of Cellulosic fibre. TLO 3.3 Describe with sketches the given type of dyeing method with procedures TLO 3.4 Describe with sketch the principle and working of Dyeing Machineries. TLO 3.5 Explain the comparison between batch-wise and continuous dyeing machines. TLO 3.6 Explain ancient method used for dyeing of cellulosic fibres.	Unit III – Dyeing of Textile fibres 3.1 Colouring matter: classification of dyes. 3.2 Classification, Methods of application and after treatments of Direct, Reactive, Vat dyes etc. 3.3 Disperse dyes: dyeing mechanism, Carrier dyeing, HTHP dyeing process of Polyester 3.4 Dyeing processes, process parameters, faults and remedies. 3.5 Machines for dyeing: batch wise and continuous and comparison 3.6 Ancient dyeing method: dyeing cellulose with natural colors	Lectures, Presentations, Assignments, Practical, YouTube simulation.
SECTION --II			
04	TLO 4.1 Describe with sketches the procedure for of the given method of printing. TLO 4.2 Describe the features of the given style of printing. TLO 4.3 Describe with sketches the construction of given type of printing machine TLO 4.4 Describe with sketches the procedure for printing of the given type of fabric sample TLO 4.5 Describe with sketches the procedure for of the given method of printing. TLO 4.6 Describe the features of the given style of printing. TLO 4.7 Describe with sketches the construction of given type of printing machine.	Unit IV – Basic concepts of printing 4.1 Printing: objective, Methods and Styles of Printing Fixation of printed textiles 4.2 Screen printing: Flatbed screen printing m/c. and its various parts. Technical features of printing with Flat - bed printing m/c. . Rotary screen printing m/c. and its various parts. Squeeze system. Technical features of rotary printing machine. 4.3 Printing with direct dye :Print paste, ingredients for direct and discharge style of printing 4.4 Printing with reactive dyes: Print paste ingredients for direct, discharge and resist style of printing. 4.5 Pigments printing: mechanism and method of printing.	Lectures, Presentations, Assignments, Practical, YouTube simulation.
05	TLO 5.1 Describe the features of the given type of finishing machinery. TLO 5.2 Describe with sketches the mechanism of the given type of	Unit V – Basic concepts of finishing 5.1 Finishing: objective of textile finishing, classification of finishing	Lectures, Presentations, Assignments, Practical, You-

	finishing TLO 5.3 Describe with sketches the given type of softening treatment TLO 5.4 Describe with sketches the mechanism of flame retardent finishing for the given type of fabrics. TLO 5.5 Select appropriate softener/stiffeners for required finish.	5.2 Finishing machinery : Calendaring, Decatising , VDR , Sanforising, Stenter etc 5.3 Resin finishing :Mechanism of creasing and resin finishing, Types of resin finishing, methods of application 5.4 Flame retardant finishing: Concept of flame proof and flame retardancy. Limiting oxygen Index and its importance, Thermal behaviour of textile fibres. 5.5 Softening and stiffening treatments: classification of softeners, Properties, application of softener.	tube simulation.
06	TLO 6.1 6a. Explain various methods for Identification of textile fibres. TLO 6.2 Describe with procedures the objectives of fastness properties. TLO 6.3 Explain methods of assessment of fastness properties	Unit VI – Fibre identification and Blend analysis 6.1 Methods of fibre identification: Burning test and solubility test. 6.2 Fastness properties –light ,rubbing, washing, sublimation, etc. 6.3 Blend analysis method-physical and chemical.	Lectures, Presentations, Assignments, Practical, You-tube simulation.

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identify various apparatus and glassware used for practical. LLO 1.2 Select suitable apparatus and glassware for the practical execution. LLO 1.3 Use relevant apparatus and glassware for the practical execution and understand the effect of change in finish on cotton fabric.	1	Desize the given grey cotton fabrics by using acid/enzyme.	03*	CO1
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of after treatments on dyed of cotton.	2	Scour the given cellulosic and synthetic fabrics.	03*	CO1
LLO 2.1 Identify various apparatus and	3		3	CO2

<p>glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different concentrations of exhausting agents on dyeings of cotton.</p>		Bleach the given cotton fabric by using sodium hypochlorite.		
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different MLR on dyeing of cotton.</p>	4	Bleach the given cellulosic and synthetic fabrics by using H ₂ O ₂	3	CO2
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different concentration of fixing agents on dyeing of cotton.</p>	5	Bleach the given cellulosic and synthetic fabrics by using hydrogen peroxide.	3	CO2
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.</p>	6	Dye the given fabric sample by using direct dyes.	03*	CO3
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.</p>	7	Dye the given fabric sample by using reactive dyes.	3	CO3
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.</p>	8	Dye the given polyester/nylon fabric with disperse dyes by using H.T.H.P./ Carrier dyeing method	3	CO3
LLO 2.1 Identify various apparatus and	9		3	CO4

glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.		Dye the given acrylic fabric by using cationic dyes.		
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	10	Print the given fabric sample by direct style of printing by using direct dyes	3	CO6
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	11	Print the given fabric sample by discharge styles of printing by using reactive dyes.	3	CO6
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	12	Print the given fabric sample by discharge styles of printing by using reactive dyes	3	CO5
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	13	Print the given fabric sample by pigment printing method.	3	CO4
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	14	Carry out soft finish on the given fabric samples	3	CO5
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and	15		3	CO6

glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.		Carry out Blend analysis of given fabric		
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	16	Carry out Washing fastness test of colored fabrics	3	CO6

VII - SUGGESTED MICRO PROJECTS / ASSIGNMENTS / ACTIVITIES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

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:

(a) Market survey of different processed fabrics and compare the following points.

- ❖ construction and type of weave
- ❖ processes carried out
- ❖ Applications of the given fabric.

(b) Visit any synthetic process house nearby to your house and take the help of processing in-charge to know the various processes.

(d) Write report on visit to dye house and compare the existing process conditions.

(e) Read the safety precautions of various chemicals and machinery used in process house.

(f) Do internet survey and prepare chart of various finishes, chemicals and machines in market.

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

(h) Library/ Internet survey of developments in all fibre finishing.

(i) Prepare power point presentation for understanding various finishing processes

(j) Understand faults in dyeing and find relevant remedies.

(k) Understand good work practices in synthetic fabric dyeing.

SUGGESTED ASSIGNMENTS –

A suggestive list is given here. Similar ASSIGNMENTS could be added by the concerned faculty:

(a) Pretreatments: Prepare models to demonstrate Fundamental methods of desizing, scouring, bleaching, mercerization and OBA treatment.

(b) Dyeing and Printing: Prepare models to demonstrate Fundamental methods of Dyeing & printing of different textile fibre varieties with different class of dyes and machines

(c) Finishing & Testing: Prepare models to demonstrate Fundamental methods of

finishing processes, chemicals and machineries, testing of textiles for different test parameters.

VIII – LABORATORY EQUIPMENTS / INSTRUMENTS / TOOL AND SOFTWARES REQUIRED.

Sr. No	Equipment Name with Borad Specifications	Relevant LLO Number
1	Padding mangle machine, pots each with 250 / 500 ml. capacity.	1, 2,3, 4, 5, 6
2	Water bath with steel dye pots with 250 / 500 ml. capacity.	7,8,9, 10,11,12, 13,14,15
3	Drying, Curing & Setting Chamber (Oven), Max. Temperature -200°C	All
4	Electronic balance with 0.001gm accuracy, capacity 300 gm.	All
5	Glassware – Watch glass, Beaker, Glass rod, Pipette, cylinders etc.	All
6	Relative finishing agents samples and chemicals	All

IX SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTES AND ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Applied Cos	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	I	Basics of pretreatment processes	CO1	10	6	4	4	14
2	II	Bleaching of regenerated and synthetic fibres	CO2	06	5	3	2	10
3	III	Dyeing of Textile fibres	CO3	08	5	3	3	11
4	IV	Basic concepts of printing	CO4	09	6	4	3	13
5	V	Basic concepts of finishing	CO5	10	6	4	4	14
6	VI	Fibre identification & blend analysis	CO6	05	4	2	2	08
				48	32	20	18	70

X. ASSESSMENT METHODOLOGY /TOOLS

Formative Assessment (Assessment for learning)

- Lab. Performance (Term work)

Summative Assessment (Assessment of Learning)

- End of Term examination – Practical Exam and Viva-voce

XI . SUGGESTED CO-PO MATRIX FORM

Course Outcomes	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life long learning	PSO -1	PSO -2	PSO -3
CO1	2	2	3	1	1	1	2	2	3	3
CO2	2	2	3	1	1	1	2	2	3	3
CO3	2	2	3	1	1	1	2	2	3	3
CO4	2	2	3	1	1	1	2	2	3	3
CO5	2	2	3	1	1	1	2	2	3	3
CO6	2	2	3	1	1	1	2	2	3	3

Legends: - High: 03, Medium: 02, Low: 01, 0: No mapping

PROGRAM SPECIFIC OUTCOMES (PSO's)

(What s/he will continue to do in the textile and related industry soon after diploma programme)

PSO 1: Perform preparatory, Colouration and Finishing of Textiles using various relevant technologies.

PSO 2: Perform Quality identification, evaluation of textiles, Fibres, Yarns, Fabrics, Dyes and Chemicals using various standard test methods.

PSO 3: Maintain various textile machines to produce various types of quality textiles at optimum and sustainable cost.

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr. No.	Author	Title	Publisher
1	Datya .K.V & Vaidya .A.A	Chemical processing of synthetic and its blends	A wiley inter science publication ISBN-0901956740 ,1984
2	Trotman, E. R. T.	Dyeing and chemical Technology of Textile Fibres	John willey and Sons Inc, 1985 ISBN: 978-0471809104
3	Shenai, V.A	Fundamental Principles of Textile Processing	Sevak Publications, Bombay, 1984 <i>ISBN 13: 9783659686047.</i>
4	Clarke, W.	An Introduction to Textile Printing	CBS Publishers and Distributors Pvt. Ltd., New Delhi 2004; ISBN: 9781855739949
5	Gulrajani, M. L.	Silk Dyeing printing and finishing	BPB Publications, New Delhi 2016, ISBN:978-8183331630

6	Grover, E.B; Hamby, D.C.	Hand book of Textile Testing & Quality Control	John Wiley & Sons Inc., 1960, ISBN: 9780470329016
7	Hurst, George and Henry	Silk Dyeing, Printing and Finishing	Ratebooks club.com,2012 ISBN-9781130986525
8	Amutha K.	A Practical Guide to Textile Testing	Wood Head Publishing, New Delhi, 2016. ISBN: 9789385059070
9	Basak Anindita	Environmental Studies	Pearson education
10	Heywood	Textile Finishing	<i>SDC Publications</i> <i>ISBN-9780901950811</i>
11			

XIII LEARNING WEBSITES AND PORTALS

Sr. No.	Links / Portals	Description
1	Textilelearner.blogspot.in/2011/03/description-of-textile-finishing_1796.html	
2	Textilelearner.blogspot.in/2012/03/textile-softening-fabric-softening.html	
3	www.onlineclothingstudy.com/2015/11/mechanical-finishes-textiles.html	
4	Textileapex.blogspot.in/2015/03/resin-finishing-importance.html	
5	Textilelearner.blogspot.in/2011/05/description-of-optical-brightening_4142.html	
6	www.teonline.com/knowledge-centre/flame-retardants.html	
7	Textilelearner.blogspot.com/printing-method-method-of-printing	
8	www.tikp.co.uk/knowledge/technology/finishing/textile-finishing	
9	Textilefashionstudy.com/finishing-of-textiles-definitions-objective	
10	www.fibre2fashion.com/industry-article/1240/antimicrobial-finishes	

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE

S. No.	Name	Institute	Contact No.	Email
1	Shri. Bhagwan R Khade Lecturer	Sasmira, Mumbai	9930602109	bhagwankhade@sasmira.edu.in

Textile Colour and Design**C232206**

Program Name	:	Diploma in Textile Technology / Diploma in Textile Chemistry / Diploma in Knitting Technology
Program Code	:	TT / TC /KT
Semester	:	Second
Course Title	:	Textile Colour and Design
Course code	:	C232206

I RATIONAL

When fabric or garments made out of it are purchased by consumers, the consumer looks for innovative designs, new prints, colour scheme. Consumer's perception depends on many factors, but the design concept, texture, feel, colour scheme, arrangement of motif are some of the important factors he is looking for.

A textile engineer should have relevant knowledge of inspiration of design, principles of design, various colour schemes methods of composing design which can help him to understand consumer's preference and choice. This course intends to equip students with the concepts, principles of textile designs, colour schemes and their attributes.

This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts of textile designs and colour scheme to create innovative designs to meet ever changing consumer demands.

II INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) Apply design principles to create innovative pint and woven designs.

III COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning
CO1 - Use various elements of art proficiently to create attractive designs as per requirement.

CO2 - Apply various principles of design judiciously to evolve innovative designs.

CO3 - Create innovative textile designs by using various colour harmonies.

CO4 - Use various methods of composing all over designs to develop innovative textile designs as per requirement.

CO5 – Create innovative designs for various types of textiles

CO6 - Explain role of designer, forecasting and market trends

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

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			Actual Contact Hrs/ week			SL H	NL H		Paper Duration (hrs)	Theory			Based on LL and TL				Based on SL			
			CL	TL	LL					FA-TH	SA-TH	Total	Practical		SLA					
						Max	Min						Max	Min		Max	Min			
C232206	Textile Colour and Design	DSE	1	0	3	1	5	2.5	-	-	-	-	-	25	10	25	10	25	10	75

Total IKS hours for semester: 2 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

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SECTION I			
1	<p>TLO 1.1 Use different inspiration techniques to produce a design</p> <p>TLO 1.2 Define lines and use different types of lines to create design.</p> <p>TLO 1.3 Explore importance of direction while composing a design</p> <p>TLO 1.4 Use elements of arts like shapes, sizes and texture to create innovative designs as per requirement.</p> <p>TLO 1.5 Apply various elements of arts to compose design as per requirement of end use.</p>	<p>Unit - I Inspiration of Design and Elements of Arts</p> <p>1.1 Inspiration of design – Nature, Man-made objects, combination and designs by other designers</p> <p>1.2 Line – Concept, definition, types of lines.</p> <p>1.3 Directions- types.</p> <p>1.4 Shapes – definition, different types.</p> <p>1.5 Size – Concept development.</p> <p>1.6 Textures – concepts and application.</p> <p>1.7 Value – Concept, use of element in art.</p> <p>1.8 Colour – definition, sensation process and use.</p>	Hands-on Demonstration Presentations
2.	<p>TLO 2.1 Employ repetition and alternation principles of design while composing a textile design.</p> <p>TLO 2.1 Apply harmony, gradation and contrast principles of design to create innovative textile designs.</p> <p>TLO 2.3 Use unity, balance and dominance and application principles of design to compose textile design for given end use.</p> <p>TLO 2.4 Apply various principles of design to create innovative textile designs for given application.</p>	<p>Unit - II Principles of Textile Design</p> <p>2.1 Repetition – Technical concept</p> <p>2.2 Alternation – Size, direction, colour shapes, permutation, & combination.</p> <p>2.3 Harmony – Pure and Discard.</p> <p>2.4 Gradation – Shape, size and colour.</p> <p>2.5 Contrast – Hue, colour and value contrast.</p> <p>2.6 Unity – concept development.</p> <p>2.7 Balance – Formal and informal balance.</p> <p>2.8 Dominance and sub-ordination –</p>	Hands-on Demonstration Presentations

		concept and application.	
3.	<p>TLO 3.1 Apply concept of light theory of colour and draw and colour chromatic circle.</p> <p>TLO 3.2 Apply concept of pigment theory of colour and draw and colour colour wheel.</p> <p>TLO 3.3 Create textile designs by using concept of colour modification for given application.</p> <p>TLO 3.4 Select colour harmony for textile design intended for a particular application.</p> <p>TLO 3.5 Use various colour harmonies textile designs suitable for required end uses.</p>	<p>Unit - III Colour Theories</p> <p>3.1 Light theory of colour- concept and application, chromatic circle and colour vision.</p> <p>3.2 Pigment theory of colour – concept and application, colour wheel.</p> <p>3.3 Attributes of primary, secondary and tertiary colours</p> <p>3.4 Colour modification – concept and application.</p> <p>a) High key</p> <p>b) Mid key</p> <p>c) Low key</p> <p>d) Change in hue</p> <p>e) Change in value</p> <p>f) Neutralised colour</p> <p>3.5 Colour harmonies- Concept, need and requirement.</p> <p>a) Achromatic colour harmony</p> <p>b) Monochromatic colour harmony</p> <p>c) Analogous colour harmony</p> <p>d) Complementary colour harmony</p> <p>e) Split complementary colour harmony</p> <p>f) Double split complementary colour harmony</p> <p>g) Tirade colour harmony</p>	<p>Hands-on Demonstration Presentations</p>
SECTION II			
4.	<p>TLO 4.1 Apply principle of unit repeating design while composing textile design.</p> <p>TLO 4.2 Apply principle of drop device to create textile design suitable for given application.</p> <p>TLO 4.3 Select a base for composing textile design suitable for given application.</p> <p>TLO 4.4 Create textile design using concept of drop reverse.</p> <p>TLO 4.5 Use sateen system of distribution to create an all-over design for required end use.</p>	<p>Methods of composing all over designs</p> <p>4.1 Unit repeating design – concept and example.</p> <p>4.2 Drop device – Principle of half drop, one third drop and quarter drop designs, advantages of drop device.</p> <p>4.3 Different bases used for application of half drop principle</p> <ul style="list-style-type: none"> • Diamond base • Ogee base • Diagonal waved line base • Rectangular base • Drop revers design – advantages <p>4.4 Sateen system of distribution – Regular sateen and irregular sateen, advantages and disadvantages.</p>	<p>Hands-on Demonstration Presentations</p>
5.	<p>TLO 5.1 Construct required stripe colour and weave effect using various methods</p> <p>TLO 5.2 Construct required check colour and weave effect using various methods</p>	<p>Unit - V Designs for various types of Textiles</p> <p>5.1 Design for Woven Fabrics</p> <ul style="list-style-type: none"> • Colour strips and checks 	<p>Hands-on Demonstration Presentations</p>

	<p>TLO5.3 Create designs for Printed Textiles</p> <p>TLO 5.4 Create designs for Dyed Textiles</p> <p>TLO 5.5 Create designs simulating surface embellishment on Textiles</p>	<ul style="list-style-type: none"> • Stripe colour and weave • Check colour and weave <p>5.2 Design for Printed Textiles</p> <ul style="list-style-type: none"> • Methods of Printing <p>5.3 Design by Dyeing Textiles</p> <ul style="list-style-type: none"> • Resisting the yarns (Ikat) • Tie and Dye (Bandhni) • Resisting by Wax (Batik) • Resist through flooding and stitching (Shibori) • Clamp Technique (Jiastia) <p>5.4 Surface embellishment on Textiles</p> <ul style="list-style-type: none"> • Embroidery • Applique • Patch work • Fabric Gathering • Smocking • Fabric folding • Thread pulling 	
6.	<p>TLO 6.1 Explain Role of Textile Designer</p> <p>TLO 6.2 Explain Timing and Planning in Textile Industry</p> <p>TLO 6.3 Explain Forecast and Market Trends</p>	<p>Unit - VI Textile Designer</p> <p>6.1 Role of Textile Designer</p> <p>6.2 Timing and Planning in Textile Industry</p> <p>6.3 Forecast and Market Trends</p>	<p>Hands-on Demonstration Presentations</p>

VI LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identify different elements of Art LLO 1.2 Identify use of different elements of art in a design	1	*Create motif from natural or man-made object and draw its decorative, geometrical and abstract form.	3	CO1
LLO 2.1 Identify different principles of design. LLO 2.2 Identify use of different principles in a design.	2	*Elaborate use of each principle of designs with example.	3	CO2
LLO 3.1 Identify different colours in Light theory LLO 3.2 Apply knowledge of Light theory of colour for drawing light theory colour chart	3	Draw and colour Light theory of colour	3	CO3
LLO 4.1 Identify different colours in Pigment theory LLO 4.2 Apply knowledge of Pigment theory of colour for drawing pigment theory colour chart	4	*Draw and colour Pigment theory of colour	3	CO3
LLO 5.1 Apply knowledge of Pigment		*Draw and colour Colour wheel		

theory of colour for drawing colour wheel	5		3	CO3
LLO 6.1 Identify different methods for changing value of colour LLO 6.2 Apply knowledge of value of colours for drawing value charts	6	*Draw and colour Grey Scale, shades and tints.	3	CO3
LLO 7.1 Identify different colour harmonies LLO 7.2 Identify different bases for placement of motif LLO 7.3 Apply Knowledge of colour harmonies and bases for creating allover design	7	Create a allover design of 8" X 8" size for Dress Material (Casual Wear) – select your own motif, colour harmony and method of placement of motif	3	CO3, 4
LLO 8.1 Identify different colour harmonies LLO 8.2 Identify different bases for placement of motif LLO 8.3 Apply Knowledge of colour harmonies and bases for creating allover design	8	Create a allover design of 8" X 8" size for Dress Material (Party Wear) – select your own motif, colour harmony and method of placement of motif	3	CO3,4
LLO 9.1 Identify different colour harmonies LLO 9.2 Identify different bases for placement of motif LLO 9.3 Apply Knowledge of colour harmonies and bases for creating allover design	9	Create a allover design of 8" X 8" size for Bed sheet – select your own motif, colour harmony and method of placement of motif	3	CO3,4
LLO 10.1 Identify different colour harmonies LLO 10.2 Identify different bases for placement of motif LLO 10.3 Apply Knowledge of colour harmonies and bases for creating allover design	10	Create a allover design of 8" X 8" size for Curtains – select your own motif, colour harmony and method of placement of motif	3	CO3,4
LLO 11.1 Identify different colour harmonies LLO 11.2 Identify different bases for placement of motif LLO 11.3 Apply Knowledge of colour harmonies and bases for creating allover design	11	Create a allover design of 8" X 8" size for Kids Wear – select your own motif, colour harmony and method of placement of motif	3	CO3,4
LLO 12.1 Identify different colour harmonies LLO 12.2 Identify different bases for placement of motif LLO 12.3 Apply Knowledge of colour harmonies and bases for creating allover design	12	Create a allover design of 8" X 8" size for Night Suits (Men's/Women's/Kid's) – select your own motif, colour harmony and method of placement of motif	3	CO3,4
LLO 13.1 Identify different colour harmonies LLO 13.2 Identify different bases for placement of motif LLO 13.3 Apply Knowledge of colour harmonies and bases for creating allover design	13	*Create a allover design of 8" X 8" size for Saree – select your own motif, colour harmony and method of placement of motif	3	CO3,4

LLO 14.1 Identify different methods of printed textiles LLO 14.2 Identify different methods of designs by dyeing textiles LLO 14.3 Apply Knowledge of designs by printing and dyeing textiles for creating allover design	14	Create a allover design of 8" X 8" size for Ethnic Wear – select your own motif, printed / dyed textiles	3	CO5
LLO 15.1 Identify different methods of printed textiles LLO 15.2 Identify different methods of designs by dyeing textiles LLO 15.3 Apply Knowledge of designs by printing and dyeing textiles for creating allover design	15	Create a allover design of 8" X 8" size for Traditional Textiles – select your own motif, printed / dyed textiles	3	CO5
LLO 16.1 Identify different methods of woven stirp effect LLO 16.2 Apply knowledge of woven strip effect to produce shirting design	16	Create a allover design of 8" X 8" size for woven Strip Shirting	3	CO5
LLO 17.1 Identify different methods of woven check effect LLO 17.2 Apply knowledge of woven strip effect to produce shirting design	17	Create a allover design of 8" X 8" size for woven check Shirting	3	CO5
Note: Out of above suggestive LLOs - <ul style="list-style-type: none"> • '*' Marked Practical (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs is to be performed to achieve desired outcomes. 				

VII SUGGESTED MICRO PROJECTS / ASSIGNMENTS / ACTIVITIES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

Self-Learning

Following are some suggestive self-learning topics: 1) Role of Textile Designer. 2) Timing and Planning in Textile Industry. 3) Colour Forecasting 4) Market Trends

Micro project

The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field- based as suggested by Teacher. 1) Do a survey of various elements of arts using internet. 2) Survey various principles of design using internet. 3) Study different design from books of textile design and recognize the colour harmonies used in those design. 4) Collect sample of fabric swatches from market which show effect of fabric characteristics on appearance of colour. 5) Collect sample of fabric swatches from market which show compound colour and weave effect and analyze them. 6) Use internet to study history of textile design. 7) Collect information about various CATD softwares used in industry, their advantages, hardware requirements and cost of the software

VIII LABORATORY EQUIPMENTS / INSTRUMENTS / TOOL AND SOFTWARES REQUIRED.

Sr. No	Equipment Name with Borad Specifications	Relevant LLO Number
1	Drawing sheets, Pensil HB, 2B, 4B, 6B, eraser, Poster Colour Box, Colour pallet, Colouring brush of different numbers, 12" Scale, Set squares, Rounder, Tracing paper, Waste cloth piece, Small water container/flask	All

IX SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTES AND ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Applied Cos	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	I	Inspiration of Design and Elements of Arts	CO1	2	0	0	0	0
2	II	Principles of Textile Design	CO2	3	0	0	0	0
3	III	Colour Theories	CO3	2	0	0	0	0
4	IV	Methods of composing all over designs	CO4	3	0	0	0	0
5	V	Designs for various types of Textiles	CO5	3	0	0	0	0
6	VI	Textile Designer	CO6	2	0	0	0	0
				15	0	0	0	0

X ASSESSMENT METHODOLOGY /TOOLS**Summative Assessment (Assessment for learning)**

- Lab. Performance (Term work)

XI SUGGESTED CO-PO MATRIX FORM

Course Outcomes Cos	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Lifelong learning	PSO -1	PSO -2	PSO -3
CO1	-	-	3	1	-	-	-	1	2	-
CO2	1	-	3	1	-	-	-	1	3	-
CO3	2	-	3	1	-	-	1	1	3	-
CO4	2	-	1	1	-	-	1	1	3	-
CO5	3	1	-	-	-	2	1	1	1	-
CO6	2	2	1	-	-	-	-	1	1	-

Legends: - High: 03, Medium: 02, Low: 01, 0: No mapping

PROGRAM SPECIFIC OUTCOMES (PSO's)

(What s/he will continue to do in the textile technology specific industry soon after diploma programme)

PSO 1: Perform spinning, weaving, Knitting and garmenting processes using various relevant technologies.

PSO 2: Execute designing and development of various textile products using various relevant technologies.

PSO 3: Maintain various textile machines to produce various types of quality textiles at optimum cost.

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr. No.	Author	Title	Publisher
1	Z. Grosicki	Watson's Textile Design and Colour	Universal Publishing Corporation, Mumbai - India. ISBN 81-85027-11-0.
2	V.A. Shenai	History of Textile Designs	Sevak Publications, Mumbai
3	C.R. Sadhale	Instruction Package on Application of Arts and Design to Textiles	Private circulation TTTI, Bhopal and DKTE, Ichalkaranji

XIII LEARNING WEBSITES AND PORTALS

Sr.No.	Links / Portals	Description
1	https://en.wikipedia.org/wiki/Elements_of_art	Elements of Art
2	http://www.artyfactory.com/art_appreciation/visual-elements/visual-elements.html	Elements of Art
3	https://artclasscurator.com/principles-of-design-examples/	Principles of Design
4	https://www.slideshare.net/erinsmith.art/principles-of-design-252201	Principles of Design
5	https://clivepowseyartinstruction.weebly.com/visual-examples-of-the-principles-of-design.htm	Principles of Design
6	http://www.tigercolor.com/color-lab/color-theory/color-harmonies.htm	Colour Harmony
7	https://anneroselt.com/2018/03/26/creating-colour-harmony/	Colour Harmony
8	https://simplicable.com/new/color-harmony	Colour Harmony
9	https://www.tandfonline.com/doi/abs/10.1080/00405000.2014.887239	Colour Harmony
10	https://www.researchgate.net/publication/260165373_Effect_of_cotton_fiber_and_yarn_characteristics_on_color_variation_in_woven_fabric_dyed_with_vat_dyes	Effect of Fabric Properties
11	https://www.researchgate.net/publication/221913744_Color_and_Weave_Relationship_in_Woven_Fabrics	Effect of Fabric Properties
12	https://www.culturalindia.net/indian-crafts/indian-textiles.html	Traditional Textiles
13	http://www.india-crafts.com/textile/weaving_traditions/brocade/	Traditional Textiles
14	https://en.wikipedia.org/wiki/Shawl	Traditional Textiles
15	https://en.wikipedia.org/wiki/Embroidery_of_India	Embroidery
16	https://www.craftsvilla.com/blog/indian-prints-fabrics-bandhani-ikat-batik/	Traditional Textiles
17	https://study.com/academy/lesson/textile-design-techniques-process.html	Traditional Textiles
18	https://www.slideshare.net/mjrtipu/different-software-use-for-textile-design	CAD
19	https://www.youtube.com/watch?v=mtZWIHhpGOo	CAD

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

Sr. No	Name & Designation	Institute	Contact No.	Email ID
1.	Mr. S.S. Joglekar Sr. Lecturer (Selection Grade)	Sasmira's Institute of Man-made Textiles, Worli, Mumbai – 30.	9833909871	shirishjoglekar@sasmira.edu.in

Program Name : Diploma in Textile Technology / Diploma in Textile Chemistry / Diploma in Knitting Technology

Program Code : TT / TC / KT

Semester : Second

Course Title : Testing of Fibers and Yarns

Course code : C231205

I RATIONAL

Quality of yarn depends on the fibre properties, fibre parameters and quality of fabric on yarn properties and parameters, and their quality control and testing. The diploma engineer needs to have relevant knowledge and skills related to fibre testing and yarn testing. Fiber and Yarn testing requires recording of number of observations, which are to be analysed, interpreted and used for best results. Therefore, knowledge of fibre and yarn testing is essential for controlling yarn and fabric manufacturing process. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts of fibre and yarn testing to solve broad problems in textile manufacturing.

II INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply the concept of fibre and yarn testing to solve textile industry-based technology problems.

III COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO 1 - Select correct sampling method for given fibre, yarn and fabric and identification method for given fibre.
- CO 2 - Determine fibre fineness and fibre maturity of given fibre.
- CO 3 - Determine fibre length of given fibre by using appropriate method.
- CO 4 – Determine linear density of given yarn.
- CO 5 - Determine twist per inch and evenness of given yarn using appropriate test method.
- CO 6 - Apply principles of tensile strength testing to predict yarn behaviour in subsequent processes.

IV TEACHING-LEARNING AND ASSESSMENT SCHEME (Abbreviation – MAS, Course Category – AEC, Paper duration – 3 hr)

Course Code	Course Title	Learning Scheme					Credits									Total Marks		
		Actual Contact Hrs/ week			SLH	NLH		Theory			Based on LL and TSL				Based on SL			
		CL	TL	LL				FA-TH	SA-TH	Total		Practical		SLA				
					Max	Min				Max	Min	Max	Min	Max	Min			
C231205	Testing of Fibres and Yarns	2	-	2	1	5	2.5	30	70	100	40	25	10	25	10	25	10	175

Total IKS hours for semester: 0 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. * Self-learning hours shall not be reflected in the Time Table.
6. * Self-learning includes micro project/ assignment/ other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION I			
1	TLO 1.1 - Understand importance of textile testing. TLO 1.2 - Perform sampling of fibers and yarn TLO 1.3 - Explain sampling techniques of fiber, yarn and fabric. TLO 1.4 - Identify given fiber using appropriate method of fiber identification TLO 1.5 - Ascertain errors in testing, its causes and remedies.	Unit – I Sampling, Introduction to Testing and Fiber Identification 1.1 Objective of textile testing 1.2 Definition of sample, population 1.3 Sampling and its necessity 1.4 Selection of sample, random sampling and biased sampling 1.5 Sampling techniques of fibre, yarn and fabric 1.6 Errors in testing- types of errors, its causes and remedies 1.7 Introduction to testing standards- ASTM, BS, IS, ISO, SDC etc. 1.8 Importance of fiber identification 1.9 Fiber identification methods- a. Microscopic test b. Burning test c. Solubility (chemical) test d. Staining test e. Feel test	Improved Lecture, tutorial, Assignments, Demonstration, Simulation.
2.	TLO 2.1 - Define fiber fineness and explain its significance TLO 2.2 - Define Micronaire, Tex and Denier TLO 2.3 - Measure fineness of given fiber by various methods.	Unit – II Fiber Fineness, Fiber Maturity and Trash% 2.1 Fiber fineness and its significance 2.2 Definition- Micronaire, Tex, Denier 2.3 Measurement of fiber fineness by a) Gravimetric method	Improved Lecture, tutorial, Assignments, Demonstration, Simulation.

	<p>TLO 2.4 - Select method for determination of fineness of given fiber.</p> <p>TLO 2.5 - Define fiber maturity and explain its significance.</p> <p>TLO 2.6 - Determine maturity of given fiber using various method.</p> <p>TLO 2.7 - Select method for determination of maturity of given fiber.</p> <p>TLO 2.8 - Grade cotton fiber into various categories using various grading systems.</p> <p>TLO 2.9 - Measure invisible loss, % trash, % lint in given cotton fiber sample by Shirley trash analyzer.</p> <p>TLO 2.10 - Interpret fiber quality by computing fiber quality index (FQI)</p>	<p>b) Optical method (Projection Microscope)</p> <p>c) Electrical method- (Vibroscope).</p> <p>d) Airflow principle- Measurement by tester based on airflow principle</p> <p>2.4 Fiber maturity and its significance</p> <p>2.5 Methods of determination of fiber maturity-</p> <p>a) Caustic soda method</p> <p>b) Polarized light method</p> <p>c) Differential dyeing method</p> <p>2.6 Cotton grading- American, Egyptian and Indian cotton grading</p> <p>2.7 Invisible loss, % trash, % lint and its measurement by Shirley trash analyser</p> <p>2.8 Fiber Quality Index (FQI)</p>	
3.	<p>TLO 3.1 - Elaborate significance of fiber length in cotton spinning.</p> <p>TLO 3.2 - Determine fiber length of a given fiber by various methods.</p> <p>TLO 3.3 - Select a method for measurement of length of given fiber.</p> <p>TLO 3.4 - Select span length and uniformity ratio of fiber for production of required quality of yarn</p> <p>TLO 3.5 - Use modern testing instruments like HVI and AFIS for fiber testing.</p> <p>TLO 3.6 - Understand principle of electron microscopy and its advantages, its use in textile field.</p> <p>TLO 3.7 - Elaborate application of SEM and AFM in advance testing of fibres</p>	<p>Unit- III Fiber Length and Modern Fiber Testing Equipments</p> <p>3.1 Significance of fiber length</p> <p>3.2 Determination of fiber length by</p> <p>a. Hand sampling method,</p> <p>b. Comb sorter principle and analysis of comb sorter diagram,</p> <p>c. Fibrograph – Principle and analysis of fibrogram</p> <p>3.3 Span length, Uniformity ratio and its importance</p> <p>3.4 Basic principle and its application of – a) HVI, b) AFIS</p> <p>3.5 Principle of electron microscopy, its advantages and its various applications in textile field.</p> <p>3.6 Applications of advance testing instruments like SEM, AFM in textiles.</p>	<p>Improved Lecture, tutorial, Assignments, Demonstration, Simulation.</p>
SECTION II			
4	<p>TLO 4.1 - Solve the given simple problems based on functions.</p> <p>TLO 4.2 - Solve the given simple problems based on rules of differentiation.</p> <p>TLO 4.3 - Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, exponential functions.</p> <p>TLO 4.4 - Apply the concept of differentiation to find given equation of tangent and normal.</p> <p>TLO 4.5 - Apply the concept of</p>	<p>Unit – IV Yarn Numbering Systems</p> <p>4.1 Definition of linear density</p> <p>4.2 Yarn number, direct and indirect yarn numbering systems</p> <p>4.3 Direct yarn numbering: Tex, Denier</p> <p>4.4 Indirect yarn numbering: British, Metric, Worsted, Woolen, Linen.</p> <p>4.5 Conversion of yarn from one system to another</p> <p>4.6 Resultant count calculation.</p> <p>4.7 Weight, length and count of yarn numerical on Yarn numbering,</p>	<p>Improved Lecture, tutorial, Assignments, Demonstration, Simulation.</p>

	differentiation to calculate maxima, minima and radius of curvature for given function.	4.8 Testing of yarn count: a. Yarn in package form - Analytical method (ASTM D-1907-89) b. Quadrant balance b. Yarn removed from fabric- Beesley yarn count balance, (IS-3442-98)	
5	<p>TLO 5.1 - Differentiate between type of twist and amount of twist.</p> <p>TLO 5.2 - Select relevant twist multiplier for manufacturing yarns for given application.</p> <p>TLO 5.3 - Describe the relationship between twist and yarn strength.</p> <p>TLO 5.4 - Explain the effects of twist on properties of given yarn and fabric.</p> <p>TLO 5.5 - Select relevant twist measurement method for given yarn sample.</p> <p>TLO 5.6 - Describe the procedure to determine the yarn twist by relevant method.</p> <p>TLO 5.7 - Derive relation between tpi and yarn number</p> <p>TLO 5.8 - Describe the importance of yarn evenness testing.</p> <p>TLO 5.9 - Classify the types of variation in the given yarn.</p> <p>TLO 5.10 - Identify the causes of yarn unevenness.</p> <p>TLO 5.11 - Make use of different terms of yarn irregularity.</p> <p>TLO 5.12- Measure yarn evenness by given method.</p> <p>TLO 5.13 - Interpret results of analysis of spectrogram for identifying the faults in machinery.</p> <p>TLO 5.14 - Discuss the effect Irregularity on given yarn on yarn and fabric properties.</p> <p>TLO 5.15 - Classify yarn faults into different categories of Uster Classimat.</p>	<p>Unit V – Yarn Twist and Yarn Evenness</p> <p>(A) Yarn Twist</p> <p>5.1 Definition- twist, twist direction, balance twist, corkscrew twist, twist on twist.</p> <p>5.2 Function of twist in yarn structure, amount of twist, twist and yarn strength relationship, effect of twist on fabric properties.</p> <p>5.3 Relation between yarn number and twist per unit length, twist multiplier, twist Factor. Application of twist multiplier.</p> <p>5.4 Measurement of twist in single Yarn: i) Single yarn twist tester ii) Optical method iii) Twist to break method iv) Twist contraction method a) Measurement of twist in doubles yarn or plied yarn.</p> <p>(B) Yarn Evenness</p> <p>5.5 Introduction and significance of yarn evenness</p> <p>5.6 Concept of variation, classification of variations, basic irregularity, Limit irregularity, expression of irregularity, addition of irregularity, irregularity index, U%, C.V.%</p> <p>5.7 Short term, medium term and long term variations.</p> <p>5.8 Causes and remedies of unevenness, interpretation of unevenness.</p> <p>5.9 Measurement of yarn unevenness:</p> <p>5.10 Cutting and weighting method</p> <p>5.11 Yarn evenness measurement by a. Uster Evenness tester- Principle, working and features b. Visual examination (ASTM) c. Analysis of Spectrogram.</p> <p>5.12 Introduction to Uster Classimat Faults.</p>	Improved Lecture, tutorial, Assignments, Demonstration, Simulation
6	TLO 6.1 - Define various terms used in strength and elongation testing of	Unit VI – Fiber and Yarn Strength Testing	Improved Lecture,

	<p>textiles</p> <p>TLO 6.2 - Interpret stress-strain curve of given fiber.</p> <p>TLO 6.3 - Ascertain yield point of stress-strain curve of given fiber and use this information in processing of fiber.</p> <p>TLO 6.4 - Define important terms like Young's modulus, work of rupture and elastic recovery.</p> <p>TLO 6.5 - Enlist various factors affecting tensile properties of textiles.</p> <p>TLO 6.6 - Measure strength of given fiber using various fiber strength testers.</p> <p>TLO 6.7 Compare CRE and CRL principle of fiber testing.</p> <p>TLO 6.8 - Use single yarn strength tester to measure single thread strength of a given yarn.</p> <p>TLO 6.9 - Use Instron tester to measure single thread strength of single yarn.</p> <p>TLO 6.10 - Determine CSP of a given yarn and ascertain its quality.</p> <p>TLO 6.11 -Use ballistic strength tester to measure ballistic strength of given yarn.</p>	<p>6.1 Definition and units of terms like stress, strain, specific stress, tenacity, breaking strength, elongation and % expression.</p> <p>6.2 Force-elongation curve and stress-strain curve</p> <p>6.3 Yield point and methods of yield point construction</p> <p>6.4 Definition- Young's modulus, work of rupture, elastic recovery.</p> <p>6.5 Time dependent and instantaneous effect</p> <p>6.6 Factors affecting tensile properties of textiles</p> <p>6.7 Fiber strength testing by a) Pressley tester, b) Stelometer, correlation between both the strengths</p> <p>6.8 CRE, CRL principle, pendulum lever principle</p> <p>6.9 Single yarn strength tester – construction and working</p> <p>6.10 Principle and working of Instron tester</p> <p>6.11 Lea strength testing – a)Lea preparation by wrap reel b)construction and working of Lea tester c)Count strength product and its significance</p> <p>6.1 Ballistic strength of yarn – Principle and working of ballistic strength tester.</p>	<p>tutorial, Assignments, Demonstration, Simulation</p>
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VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identify given fiber using microscope.	1	Use microscope for identification of fiber.	2	CO1
LLO 2.1 Identify given fiber's origin by using burning test procedure.	2	Use burning test for identification of fiber.	2	CO1
LLO 3.1 Determine fineness of given fiber using cut and weight method.	3	Use cut and weight method to measure fiber fineness.	2	CO2
LLO 4.1 Determine fiber maturity of given fiber using caustic soda method.	4	Use caustic soda method to determine fiber maturity.	2	CO2
LLO 5.1 Determine mean length of given cotton fiber sample using comb sorter.	5	Use Comb sorter for measurement of fiber length	2	CO3
LLO 6.1 Determine count of given yarn using wrap reel and weighing balance.	6	Use Wrap Reel and Weighing balance to determine Yarn number and C.V. % of count.	2	CO4
LLO 7.1 Determine the count of warp	7	Determine Yarn number of yarn removed	2	CO4

and weft of given fabric.		from fabric.		
LLO 8.1 Determine the denier of given filament yarn using cut-weight method.	8	Determine of Denier of synthetic Yarn by Cut-Weight method.	2	CO4
LLO 9.1 Determine hank and C V% of hank of given sliver and roving using wrap reel.	9	Estimation of Hank and Hank C.V. % of sliver and roving sample using wrap reel.	2	CO5
LLO 10.1 Determine twist per inch of a given yarn using twist contraction principle.	10	Use twist tester working on Twist Contraction principle to determine Twist in Single yarn	2	CO5
LLO 11.1 Determine the twist per inch in a double yarn using untwisting principle.	11	Use twist tester working on Untwisting principle to determine twist in Double yarn by Untwisting method	2	CO5
LLO 12.1 Determine evenness of given yarn using Evenness Tester based on capacitance principle.	12	Use Evenness tester based on capacitance principle for Measurement of Yarn Evenness.	2	CO6
LLO 13.1 Use ASTM Yarn appearance method to grade given yarn.	13	Grade yarn by ASTM Yarn appearance method.	2	CO5
LLO 14.1 Determine the bundle strength of fiber using Stelometer.	14	Use Stelometer for measurement of bundle strength of fibers.	2	CO6
LLO 15.1 Determine single thread strength of given yarn using single thread strength tester and calculate C V % of the same.	15	Use single thread strength tester for measurement of single thread strength of yarn. Calculate C.V.% of strength.	2	CO6
LLO 16.1 Determine Lea strength of given yarn using Lea strength tester and calculate C V % of the same.	16	Use Lea strength tester for measurement of lea strength of yarn. Calculate CSP of yarn and C.C. % of CSP.	2	CO6
LLO 17.1 Measure ballistic strength of given yarn using ballistic strength tester.	17	Use ballistic strength tester for measurement of ballistic strength of yarn	2	CO6
LLO 18.1 Determine single thread strength of given yarn using Instron.	18	Use Instron tester to measure single thread strength of yarn.	2	CO6
Note – 1. Perform any 15 tutorials/practical out of 18 and ensure that all units are covered. 2. Take tutorial in a batch size of 20 to 30 students. 3. Give students 10 problems to solve on each unit.				

VII - SUGGESTED MICRO PROJECTS / ASSIGNMENTS / ACTIVITIES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- **Testing standards:** Each batch will make a table of standards of important fibre and yarn properties for test procedures of international standards like ASTM, BS etc.
- **Fiber Identification:** Each batch will make chart of fibre identification by one method.
- **Fiber Fineness:** Each batch will make a table of fineness of different fibres used in textile industry.
- **Fiber Maturity:** Each batch will make a table of maturity of different cotton varieties used in textile industry.
- **Fiber Length:** Each batch will collect 10 samples of cotton fibre and perform comb sorter experiment for each sample. Analyse comb sorter diagram and present the readings in tabular format.
- **Advance Testing Equipment:** Make a PPT on advance testing equipment like SEM, AFM and their importance in textile testing.
- **Yarn Numbering:** Each batch will collect yarns of different yarn number and prepare a chart from higher number to lower number in each system. Also prepare a chart for conversion of yarn number from one system to another.
- **Yarn Numbering:** Each batch will solve 50 numerical on yarn numbering.

- **Yarn Twist:** Collect different yarn samples used for different applications like hosiery, warp, weft, voile, fancy yarn, crepe yarn.
- **Twist Multiplier:** Identify direction of twist and calculate amount of twist and twist multiplier. Prepare chart for the same.
- **Yarn Evenness:** Collect and prepare chart of yarn samples for different faults like thick, thin, neps and also collect norms for imperfections of at least 10 counts.
- **Yarn Evenness:** Collect and prepare a chart of yarn samples for different count and find out U% of the same using Uster evenness tester.
- **Tensile Strength:** Each batch will draw schematic diagrams of different principles and instruments based on them for tensile strength testing. Test two yarn samples of different counts on these instruments and prepare a chart for test results

ASSIGNMENTS –

- Market survey of different fibres of natural and man-made origin of different linear density based on application and price.
- Market survey of different yarns of natural and man-made origin of different yarn numbers based on application and price.
- Library survey of different fibres used in the industry with respect to name of manufacturer, current price, linear density of fibre.
- Library survey of different yarns used in the industry with respect to name of manufacturer, current price, counts of yarn and blend proportion
- Prepare table for norms published by different research organizations for different yarn properties for various types of yarns.
- Prepare question bank referring old SIMMT question papers for fibre and yarn testing.
- Collect data on count of yarn, lea strength of yarn, Count Strength Product (CSP), Single thread strength of yarn. Find out Standard deviation, Variance and co-efficient of variation (CV%).
- Collect at least 10 examples on application of derivatives based on real world uses.
- Attempt any 5 – 7 assignments, out of the above assignments.

VIII – LABORATORY EQUIPMENTS / INSTRUMENTS / TOOL AND SOFTWARES REQUIRED.

Sr. No	Equipment Name with Borad Specifications	Relevant LLO Number
1	Electronic balance, with the scale range of 0.001g to 500g. Pan size 100 mm; response time 3-5 sec.; power requirement 90-250 V, 10 watt..	3, 6, 7 and 8
2	Microscope, with magnification ranges 5x to 100 x.	1 and 4
3	British wrap reel	6, 7
4	Metric wrap reel	6, 7
5	Electric oven inner size 18''x18''x18''; temperature range 100 to 250 ⁰ C. with the capacity of 40 liters, moisture tester.	9
6	Single yarn twist tester	10
7	Double yarn twist tester	11
8	Evenness tester based on capacitance principle	12
9	ASTM standard photo graph	13
10	Use Wrap Reel and Weighing balance to determine hank of sliver and calculate C.V. % of hank.	9
11	Black board wrapping machine.	13
12	Single Yarn Strength Tester	15
13	Lea Strength tester	16
14	Ballistic strength tester.	17

15	Stelometer	14
16	Instron	18

IX SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS AND ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Applied Cos	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	I	Sampling, Introduction to Testing and Fiber Identification	CO1	4	2	4	4	10
2	II	Fiber Fineness, Fiber Maturity and Trash%	CO2	6	2	4	6	12
3	III	Fiber Length and Modern Fiber Testing Equipments	CO3	5	3	4	6	13
4	IV	Yarn Numbering Systems	CO4	4	2	4	6	12
5	V	Yarn Twist and Yarn Evenness	CO5	6	3	4	6	13
6	VI	Fiber and Yarn Strength Testing	CO6	5	2	4	4	10
				30	14	24	32	70

X ASSESSMENT METHODOLOGY /TOOLS

Formative Assessment (Assessment for learning)

- Tests
- Rubrics for Cos Assignments
- Midterm Exams
- Self-learning
- Term work
- Seminar / Presentation

Summative Assessment (Assessment of Learning)

- End term Examination
- Micro-projects
- Tutorial performance

XI SUGGESTED CO-PO MATRIX FORM

Course Outcomes Cos	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Lifelong learning	PSO -1	PSO- 2	PSO -3
CO1	3	1	1	1	-	-	1	2	-	-
CO2	3	1	1	1	1	1	-	2	-	-
CO3	3	2	1	1	-	-	-	-	2	-
CO4	3	3	2	1	1	1	1	-	2	-
CO5	3	2	1	1	-	1	1	-	2	-
CO6	3	2	1	1	1	1	1	-	-	2

Legends: - High: 03, Medium: 02, Low: 01, 0: No mapping
PSO 1: Perform spinning, weaving, knitting using various relevant technologies.
PSO 2: Perform designing and garmenting using various relevant technologies.
PSO 3: Maintain various textile machines to produce various types of quality textiles at optimum cost.

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr. No.	Author	Title	Publisher
1	Morton, W.E; Hearle, J.W.	Physical Properties of Textile Fibres'	Wood head publishing 2008. ISBN 978-1-84569-220-9.
2	--	Hand book of Textile Testing-part-1: Testing and grading of textile fibres.	SP 15-1:Published 1989 Bureau of Indian Standards(BIS)
3	Skinkle, John H.	Textile Testing Physical, Chemical and Microscopical	Chemical Publishing Co Inc (1940) ASIN: B001OMN6VS
4	Booth, J. E.	Principles of Textile Testing	CBS publishers and distributors private ltd. 1996.New Delhi India. ISBN 10:81-239-0515-7. ISBN 13:9788123905150
5	Kothari, V.K.	Testing & Quality Management	IAFL, New Delhi 1999 ISBN 819010330X, 9788190103305
6	Grover,E.B; Hamby, D.C .	Hand book of Textile Testing & Quality Control	Textile Book Publishers, 1960 - <u>Technology and Engineering</u> the University of Michigan.
7	Saville, B.P.	Physical Testing of Textiles	Wood head publishing limited -2002 Cambridge England. ISBN :1 85573 367 6 CRC press ISBN: 0-8493-0568-3.
8	--	Methods of Tests, Fibre, Yarn & Fabric	CIRCOT, Mumbai
9	<u>Amutha</u> ,K.	A Practical Guide to Textile Testing	Wood head Publishing New Delhi India.2016. ISBN:978-93-85059-07-0 .

XIII LEARNING WEBSITES AND PORTALS

Sr. No.	Links / Portals	Description
1	https://www.slideshare.net/MizanurRehmanShobuj/important-of-textile-testing	Importance of Textile Testing.
2	https://www.textileschool.com/321/fiber-identification-tests-to-identify-a-fibre/	Identification of Fibers
3	https://study.com/academy/lesson/iso-textile-testing-standards.html	ISO Textile Testing Standards
4	https://nptel.ac.in/courses/116102029/14	Fineness

5	https://www.slideshare.net/malarmeganathan/fibre-strength-and-fibre-fineness	Fiber Strength and Fiber Fineness
6	https://nptel.ac.in/courses/116102029/15	Fiber length
7	https://www.scribd.com/doc/97265301/Fiber-Maturity	Fiber Maturity
8	https://nptel.ac.in/courses/116102029/12	Sampling
9	https://clothingindustry.blogspot.com/2018/01/types-fiber-length.html	Types of Fiber Length
10.	https://textilelearner.blogspot.com/2015/03/list-of-equipments-used-in-spinning-lab.html	List of instruments used in Spinning laboratory.
11.	http://textilelearner.blogspot.in/2012/05/yarn-numbering-system-yarn-count-direct.html	Yarn Numbering system
12.	http://textilestudycenter.com/yarn-numbering-system/	Yarn Numbering system
13.	https://www.slideshare.net/islamajharul/yarn-testing-machines	Yarn Testing Machines
14.	https://www.uster.com/en/knowledge/textile-know-how/yarn-testing/	Uster Tester 6
15.	https://archive.nptel.ac.in/courses/116/102/116102029/	Yarn Evenness Testing
16.	https://www.uster.com/products/staple-yarn-testing/uster-tester/	Uster testing machine
17.	https://www.textileadvisor.com/2021/06/yarn-twist-testing.html	Yarn Twist Testing
18.	https://textilelearner.net/twist-measurement-of-yarn/	Yarn Twist Measurement
19.	https://textilelearner.net/yarn-testing-in-textile/	Different Yarn Tests
20	https://textilelearner.net/determination-of-yarn-tensile-strength/	Yarn Strength Tests
21.	https://www.instron.com/en/testing-solutions/astm-standards/astm-d2256	ASTM -D2256 Yarn Testing Method.

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE
Faculty Members from Polytechnics

S. No.	Name & Designation	Institute	Contact No.	Email
1.	Mr. A. S. Deshmukh, Sr. Lecturer (Selection Grade).	Sasmira Institute, Worli, Mumbai	9833570740	asdeshmukh@sasmira.edu.in

Program Name: Diploma in Textile Technology

Program Code: TT

Semester: Second

Course Title: Weaving Preparatory Process

Course code: T231202

I RATIONALE

The Fabric Manufacture is done in various stages after the yarn has been manufactured either on Ring Frame (Spun Yarn) or Filament Yarn. Woven fabric is manufacture by interlacement of two different threads. Longitudinal yarns are called warp and horizontal yarns are called weft.

This subject intends to impart knowledge and skills in the area of Warp and weft yarn preparation. The processes like Winding, Beam Warping, Sectional Warping, twisting and Sizing are required for warp yarn preparation. Process like Winding and pirn winding are required for weft yarn preparation. These are the essential processes before actual weaving of fabric is done on the loom.

II INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

“Use principals of Winding, Warping, Twisting, Sizing and Pirn winding to prepare raw materials for weaving process.”

III COURSE LEVEL LEARNING 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 winding machine and select required parameters for manufacturing of different winding packages.
- Select relevant warping machine for manufacturing weavers beams of required quality
- Select relevant twisting machine for formation of twisted yarn for making warps.
- Select relevant sizing machine and its parameters for producing sized warp yarn of required quality.
- Inspect the quality of sizing and other quality parameter and production of sizing
- Select relevant pirn winding machine and parameters to manufacture pirns of required quality.

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category	Learning Scheme					Credits	Assessment Scheme										Total Marks	
				Actual Contact Hrs/ week			SLH	NLH		Paper Duration (hrs)	Theory				Based on LL and TL				Based on SL		
				CL	TL	LL					Practical			SLA							
							FA-TH	SA-TH			Total		FA-PR		SA-PR		Max	Min			
T231202	Weaving Preparatory Process	WPP	DSC	2	1	3	1	7	3.5	3	30	70	100	40	25	10	25	10	25	10	175

Total IKS hours for semester: 2 Hrs.

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS- Indian Knowledge System, SLA- Self Learning Assessment

Legends: @InternalAssessment, #ExternalAssessment, *#OnLineExamination, @\$Internal Online Examination

Note:

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs. *15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. *Self-learning hours shall not be reflected in the Time Table.
6. *Self-learning includes micro project / assignment / other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION I			
1	<p>TLO 1.1 Describe the process sequence to produce the given textile material</p> <p>TLO 1.2 Classify winding machine for given package requirement.</p> <p>TLO 1.3 Describe characteristic features, Passage of material and parts of different winding machine.</p> <p>TLO 1.4 Identify different supply and Make winding packages according to its end use.</p> <p>TLO 1.5 Select tensioning device and control tension for required winding parameters.</p> <p>TLO 1.6 Describe the principles of different yarn clearers and its setting</p> <p>TLO 1.7 Describe different yarn joining methods</p> <p>TLO 1.8 Calculate production of winding machine</p> <p>TLO 1.9 Identify package faults and its remedies</p> <p>TLO 1.10 Describe the features of modern winding machine</p>	<p>1.1 Unit I: Winding Process flow chart for different fabrics: a. Grey fabric b. Mono color fabrics (Dyed warp and grey weft), c. Warp or weft stripes d. Pattern e. Warp and weft both coloured.</p> <p>1.2 Objectives of winding. Classification of winding machine.</p> <p>1.3 Study of upright & double deck winding machine, drum-winding machine. & precision winding Machine</p> <p>1.4 Introduction to different winding packages, structure of supplies Packages. Different types of traverse motion. Types of yarn guide.</p> <p>1.5 Different tensioning devices and their working & other tension control technique.</p> <p>1.6 Types of yarn clearer (Slub catcher) and their working.</p> <p>1.7 Introduction to knotter and Air splicer.</p> <p>1.8 Calculation of speed & efficiency of drum winding & spindle winding. Traverse ratio. Traverse length. Winding angle.</p> <p>1.9 Different package faults and their remedies, hard waste control. Process control in winding. Maintenance</p> <p>1.10 Introduction to automatic and modern winding machines. Features of Beninnger, Autoconer 138, 238, 338, Muratek etc..</p>	Improved Lecture, tutorial, Assignments, Demonstration, Simulation.

2.	<p>TLO 2.1 Classify the given type of warping process.</p> <p>TLO 2.2 Describe the functions of parts and passage of material through given warping machine.</p> <p>TLO 2.3 Calculation related to no of beam (Beam warping) and no of sections (sectional warping) for the preparation of given weavers beam.</p> <p>TLO 2.4 Describe the feature of given modern warping machine.</p> <p>TLO 2.5 Determine the production in Kg/Shift for given data and situation</p>	<p>2.1 Unit 2 Warping Objectives of warping, Classification of warping machine and their study, Different types of creel,</p> <p>2.2 Study of beam warping machine. Study of sectional warping machine, Section preparation.</p> <p>2.3 Calculation related to number of section, section leasing, section winding, beaming. Difference between Beam Warping and Sectional Warping Machine.</p> <p>2.4 Features of modern beam warping & sectional warping machine.</p> <p>2.5 Calculations required for warping, speed calculation .measuring and stop motion calculation. Hard waste control, beam defects, Tension control. Process control in warping. Maintenance</p>	Improved Lecture, tutorial, Assignments, Demonstration, Simulation.
3.	<p>TLO 3.1 Describe different principle of Twisting.</p> <p>TLO 3.2 Describe passage of material through given twisting machine and explain functions of each element.</p> <p>TLO 3.3 Calculate twist per inch, folded yarn count, production per shift</p>	<p>3.1 UNIT 3 Twisting: Objectives of twisting –different principle of twisting.</p> <p>3.2 Study of up twisting machine and two for one twister.</p> <p>3.3 Calculation pertaining to twisting – faults and Process control in twisting. Maintenance</p>	Improved Lecture, tutorial, Assignments, Demonstration, Simulation.

SECTION II			
4	<p>TLO 4.1 Describe sizing process and its importance.</p> <p>TLO 4.2 Select suitable sizing ingredient for the preparation of size paste for given yarn type with justification</p> <p>TLO 4.3 Describe with sketches the warp passage through given sizing machine.</p> <p>TLO 4.4 Describe different parts of sizing machine and explain their functions.</p>	<p>4.1 Objectives of sizing with reference to filament and spun yarn,</p> <p>4.2 Size paste preparation. Sizing ingredients and their properties, size paste properties, recipe to size filament and spun yarn.</p> <p>4.3 Classification of sizing machine and study of various zones of sizing machines hank sizing, slasher sizing, multi-cylinder & hot air sizing.</p> <p>4.4 Different types of creels, different types of size boxes& their construction, drying Zone. Splitting zone, wet splitting. Hot air & Infra-red Drying, Single end sizing machine,</p>	Improved Lecture using PPT, Tutorial, Assignments, Demonstration, Simulation.
5	<p>TLO 5.1 Describe features of modern sizing machine.</p> <p>TLO5.2 Calculate size pick up for given yarn type.</p>	<p>5.1 Features of modern Sizing machine, various control in modern sizing machine.</p> <p>5.2 Size pick up & its importance</p>	Improved Lecture using PPT,

	TLO5.3	Determine the stretch percentage for given type of yarn.	5.3	Factor governing the pick-up of size Methods for measurement of size pick up, Process control in sizing. Maintenance	Tutorial, Assignments, Demonstration, Simulation.
6	TLO 6.1	Understand the importance of carbon compounds.	6.1	Objectives and Features of ordinary and automatic Pirn winding machines Passage and Construction	Improved Lecture using PPT, Tutorial, Assignments, Demonstration, Simulation.
	TLO 6.2	Explain the preparation and chemical reactivity of methane, ethane and acetylene.	6.2	factors affecting build of a pirn, Advantage and disadvantage of direct and rewind pirn.	
	TLO 6.3	Understand the structural formula of aromatic compounds. And chemical reactions.	6.3	Pirn winding production & efficiency calculations. Process control in Pirn winding. Maintenance	

VI LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identify Different fibres.	1	Collect Different fibers to (i) Identify and classify fibers (ii) Study properties of important fibers and compare fibers	3	CO1
LLO 2.1 Identify Different fibres.	2	Collect different yarns to (i) Identify and classify yarns (ii) Study properties of yarns and compare yarns	3	CO1
LLO 3.1 Use Classmate chart to identify the various sizes of yarn faults	3	Use Classmate chart to identify the various sizes of yarn faults	3	CO1
LLO 4.1 Use winding machine to show both the principle of joining the yarn and conversion of smaller to bigger package	4	Use winding machine to show both the principle of joining the yarn and conversion of smaller to bigger package	3	CO1
LLO 5.1 Use winding machine to identify the different principles of windings.	5	Use winding machine to identify the different principles of windings.	3	CO1
LLO 6.1 Use winding machine to inspect the function of Clearer, Splicer and tensioner	6	Use winding machine to inspect the function of Clearer, Splicer and tensioner	3	CO1
LLO 7.1 Use winding machine to Calculate production for given yarn Estimate the efficiency for given numbering systems..	7	Use winding machine to (i) Calculate production for given yarn (ii) Estimate the efficiency for given numbering systems..	3	CO1
LLO 8.1 Insert different types of knot using yarns liquid	8	Insert different types of knot using yarns	3	CO1
LLO 9.1 Use Direct warping machine to	9	Use Direct warping machine to produce	3	CO2

produce a warping beam of required specifications and quality.		a warping beam of required specifications and quality.		
Use Direct warping machine to: i) Estimate Creel capacity for given warping machine. ii) Collect five fabric samples that require Direct warping. iii) Calculate number of beams required for further process LLO 10.1 Estimate production of warp in kg/shift or meters/shift for given data	10	Use Direct warping machine to: iv) Estimate Creel capacity for given warping machine. v) Collect five fabric samples that require Direct warping. vi) Calculate number of beams required for further process vii) Estimate production of warp in kg/shift or meters/shift for given data	3	CO2
LLO 11.1 Use Boyle's law to Determination of Use sectional warping machine to demonstrate the working principle of various components.	11	Use sectional warping machine to demonstrate the working principle of various components.	3	CO2
LLO 12.1 Use sectional warping machine to 1) Estimate creel capacity 2) Collect five fabric samples that require sectional warping machine 3) Calculate number of ends per section and total number of sections for each fabric Calculate production of warping machine in kg/shift or meter per shift for given data	12	Use sectional warping machine to 4) Estimate creel capacity 5) Collect five fabric samples that require sectional warping machine 6) Calculate number of ends per section and total number of sections for each fabric 7) Calculate production of warping machine in kg/shift or meter per shift for given data	3	CO2
LLO 13.1 Use Up twisting Machine to demonstrate the working principle of various components	13	Use Up twisting Machine to demonstrate the working principle of various components.	3	CO3
LLO 14.1 Use Two for one twister to demonstrate the working principle of various components.	14	Use Two for one twister to demonstrate the working principle of various components.	3	CO3
LLO 15.1 Use sizing machine to demonstrate the working principle of various components.	15	Use sizing machine to demonstrate the working principle of various components.	3	CO4
LLO 16.1 Use sized weavers beam to calculate size beam warp count	16	Use sized weavers beam to calculate size beam warp count	3	CO4
LLO 17.1 Observe and record formulation of size paste for given fabric	17	Observe and record formulation of size paste for given fabric	3	CO5
LLO 18.1 Calculate production of sizing machine from given particulars.	18	Calculate production of sizing machine from given particulars.	3	CO5
LLO 19.1 Use pirn winding machine to demonstrate the working principle of various components.	19	Use pirn winding machine to demonstrate the working principle of various components.	3	CO6
Note – 1. Take any 15 tutorials out of 25 and ensure that all units are covered. 2. Take tutorial in a batch size of 20 to 30 students. 3. Give students 10 problems to solve on each unit.				

VII SUGGESTED MICRO PROJECTS / ASSIGNMENTS / ACTIVITIES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

1. 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) Use of videos, animation films to explain principles of winding Direct/Sectional warping, Basics of sizing process.
- (b) Visit to modern winding unit to know the working principles of various elements.
- (c) Visit to modern warping unit to know the working principles of various elements.
- (d) Visit to modern twisting unit to know the working of twisting machine.
- (e) Visit to modern sizing unit to know the working of sizing machine.
- (f) Prepare catalogue showing features of modern winding warping and twisting sizing machine.

2. 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 animation and videos available on internet for better understanding of the subject area
- (g) Use PPT available on internet for accelerated learning.

3. SUGGESTED ASSIGNMENTS

Only one assignment 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 assignments 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 assignments, the number of students in the group should **not exceed three**.

The assignment could be industry, application based, internet-based, workshop-based, laboratory-based or field-based. Each assignment 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 assignment work and give a seminar presentation of it before submission. The total duration of the assignment should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit assignment by the end of the semester to develop the industry oriented COs.

A suggestive list of assignments is given here. Similar assignments could be added by the concerned faculty.

- (a) **Basics of weaving:** Collect different fabrics samples that are produce by different principles and Stick it on the card sheet by writing properties and sketching the constructional structure of the fabric.
- (b) **Basics of Weaving:**Collect different woven fabrics like grey, mono colored yarn dyed/piece dyed, multi colored pattern and stick it on the card sheet by sketching flowchart for production of these fabrics
- (c) **Basics of weaving:** prepare card sheet showing formulas of different yarn count and yarn count conversion table.
- (d) **Basics of winding:** Collect the photographs of sectional/beam warping machine and stick on card sheet by listing the features of both machine.
- (e) **Beam warping :**Collect the photographs of various creels, tensioning devices and prepare booklet by writting their features.
- (f) **Beam warping :**Collect the photographs of various tensioning devices and stick on card sheet by writing features of each tensioning device.
- (g) **Beam warping :**Prepare chart of various tension ranges for various types of yarns.
- (h) **Sectional Warping :**Collect photograph sequence of leasing operation and stick over black card sheet.
- (i) **Sectional warping :**Prepare comparative table of salient features of various sectional/direct warping machine manufacturer .
- (j) **Basics of Sizing :**Prepare card sheet showing passage of warp trough sizing a machine and collect the photographs of various **types of** creel used for sizing and lable the features of the each creel.
- (k) **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 prepare booklet by writing features of each components and sticking on card sheet.
- (l) **Quality aspects of Sizing : Conduct the study** of migration on sizing machine and find the consequence of the same on further quality of material.
- (m) **Pirn winding:** Student will wind five different pirns by using different traverse length and traverse ratio. They will observe the performance of pirn during weaving and record the performance for submission. They will make power point presentation and present the same at the end of the semester

VIII LABORATORY EQUIPMENTS / INSTRUMENTS / TOOL AND SOFTWARES REQUIRED.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1.	Precision Cone Winding machine	1,2,3,4,5 ,6,7,
2.	Drum winding machine	1,2,3,4,5 ,6,7,
3.	Beam warping machine with working width of 1800-2400	8,9,10
4.	Sectional warping machine with speed of 1000 meters /min	11,12
5.	Two for one twister	13,14
6.	Up twisting machine	15,16
7.	Sizing machine	16.17
8.	Pirn winding Machine	18

**IX SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTES AND ASSESSMENT PURPOSE
(Specification Table)**

Sr. No.	Unit	Unit Title	Applied Cos	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	I	Winding	CO1	12	04	06	06	16
2	II	Warping	CO2	08	04	06	06	16
3	III	Twisting	CO3	04	02	02	04	08
4	IV	Basics of sizing and raw material requirement	CO4	8	03	04	04	11
5	V	Sizing quality aspect and production calculation	CO5	7	03	04	06	13
6	VI	Pirn winding	CO5	10	04	06	06	16

**X ASSESSMENT METHODOLOGY /TOOLS
Formative Assessment (Assessment for learning)**

- Tests
- Rubrics for Cos Assignments
- Midterm Exams
- Self-learning
- Term work
- Seminar / Presentation

Summative Assessment (Assessment of Learning)

- End term Examination
- Micro-projects
- Tutorial performance

XI SUGGESTED CO-PO MATRIX FORM

Course Outcomes Cos	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life long learning	PS O-1	PS O-2	PS O-3
CO1	3	1	1	2	1	1	1			-
CO2	3	1	1	2	1	1	1			-
CO3	3	1	1	2	1	1	1			-
CO4	2	2	1	1	2	1	2	3	2	3
CO5	2	2	1	1	2	1	2	3	2	3
CO6	2	2	1	1	2	1	2	3	2	3

Legends :- High : 03, Medium : 02, Low : 01 , 0 : No mapping

PSO 1: Perform preparatory, colouration and finishing of textiles using various relevant technologies.
PSO 2: Perform Quality evaluation of textiles, fibres, yarns, Fabrics, Dyes and chemicals using various standard Test
PSO 3: Maintain Various Textile machines to produce various types of quality textiles at optimum and sustainable cost

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr.No	Author	Title	Publisher
1	Lord P. R.	Weaving conversion of yarn to fabric	Woodhead publication ISBN: I 855734834
2	Buvanesh C. Goswami Rajesh D. Anandjiwala David M.HALL	Textile sizing	Marcel Dekker, New York ISBN: 0-8247-5053-5
3	Talukdar M.K, Ajgaonkar D.B. Sriramlu P.K	Weaving machines Mechanisms, Management	Mahajan Publisher Private Ltd, ISBN: 81-85401-16-0
4	R. N. Kanoongo P.R. Roy	Cotton Yarn Weaving	
5	Talukdar M.K	Winding and Warping	Mahajan Publisher Private Ltd, I

XIII LEARNING WEBSITES AND PORTALS

Sr.No	Link / Portal	Description
1	<ul style="list-style-type: none"> ➤ www.nptel.ac.in/courses/116102005/16 ➤ www.nptel.ac.in/courses/116102005/19 ➤ www.karlmayer.com/en/products/warp-preparation/Yarntensioners-yarn-stop-motion/ ➤ www.karlmayer.com/en/products/warp-preparation/sectional-warpers/automatic-sectional-warpers/ ➤ www.youtube.com/watch?v=fAvLgG8R100 ➤ https://wikipedia.org/wiki/textile_sizing_machine ➤ https://nptel.ac.in/courses/116102005/13 ➤ https://textileapex.blogspot.com/2015/01/winding-machine-technical-features.html ➤ https://textilechapter.blogspot.com/2017/04/high-speed-warping-machine-textile-weaving.html ➤ https://textilechapter.blogspot.com/2016/10/warping-weaving-types-features-characteristics.html ➤ https://textilelearner.blogspot.com/2011/08/high-speed-warping-sectional-warping_1120.html ➤ https://textilelearner.blogspot.com/2014/01/automation-in-warping-and-sizing-process.html ➤ https://nptel.ac.in/courses/116102005/22 ➤ https://www.slideshare.net/sheshir/sizing ➤ https://nptel.ac.in/courses/116102005/20 ➤ https://textilechapter.blogspot.com/2017/03/sizing-calculation-formula-textile-weaving.html ➤ https://nptel.ac.in/courses/116102038/40 	

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

S. No.	Name & Designation	Institute	Contact No.	Email
1.	Mr. H. V. Ramteke, HOD, DTT	Sasmira Institute, Worli, Mumbai	9766306847	hoddmtt@sasmira.edu.in

Program Name : Diploma in Textile Technology / Diploma in Textile Chemistry
 Program Code : DTT / DTC / DKT
 Semester : Second
 Course Title : GENERAL ENGINEERING
 Course code : C233204

I RATIONALE

Textile industry is totally depends upon electrical as well thermal energy for functioning of its various utilities like boilers, condensers, generators, motors, transformers etc. This subject will impart the basic knowledge about the economical generation and efficient industrial utilization of electrical and thermal energy associated with textile machineries.

II INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

“Apply concepts of electrical, mechanical and thermal engineering in textile machineries, operations and process”.

III COURSE LEVEL LEARNING 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:

- Apply the thermodynamics principle, to generate steam in textile industry.
- Compare various boilers along with condenser used in textile processes.
- Explain the air conditioning refrigeration processes & I. C engines as applicable to textile industries.
- Use electro-magnetic induction along with necessities laws & measuring instrument for calculating voltage, current and power.
- Compare of alternating current (A.C.) & direct current (D.C.) theory along with A.C. / D.C. motors / generators & associated single/ three phase circuits relevant to machineries in textile industries.
- Analyze the requirement of single & three phase induction motors & transformers & its applications to textile industries.

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory			Based on LL & T L				Based on SL		Total Marks	
				CL	TL	LL					Total	Practical		SLA							
							FA-TH	SA-TH				Max	Min	Max	Min	Max	Min	Max	Min		
C233204	GENERAL ENGINEERING	GE	GE	2	-	-	-	2	1	1.5	15	35*#	50	20	-	-	-	-	-	-	50

Total IKS hours for semester: 0 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

Legends: @InternalAssessment, #ExternalAssessment, *#OnLineExamination,@\$Internal Online Examination

Note:

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.*15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. *Self-learning hours shall not be reflected in the Time Table.
6. *Self-learning includes micro project /assignment / other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION I			
1	<p>TLO1.1 Describe the concept of give physical Explain first and second law of thermodynamics.</p> <p>TLO1.2 Apply Clausius's and Kelvin Plank's statements laws of thermodynamics.</p> <p>TLO1.3 Explain heating characteristics of various materials.</p> <p>TLO1.4 Explain relationship of pressure volume & temperature in thermodynamic processes, open, closed & natural processes and elaborate P-V diagram</p> <p>TLO1.5 Comparison of various types of steam and Explain Dryness fraction.</p> <p>TLO1.6 Use steam table for process data with respect to pressure volume &</p>	<p>Basic Laws Of Thermodynamics & Properties of Steam</p> <p>1.1 Law of conservation of energy. First and second law of thermodynamics.</p> <p>1.2 Clausius's and Kelvin Plank's statements.</p> <p>1.3 Specific heats, their relationships and ratio.</p> <p>1.4 Simple thermodynamic process such as constant volume, constant pressure, isothermal and adiabatic, hyperbolic, polytropic and throttling. (only introduction and P-V diagram)</p> <p>1.5 Important terms such as wet steam, dry steam, superheated steam, dryness fraction, sensible heat, enthalpy and specific volume of steam.</p> <p>1.6 Steam table and its use. Advantages of superheated steam.</p>	<p>Improved Lecture, tutorial, Assignments, Demonstration, Simulation.</p>

	temperature. Use application of superheated steam in textile processes.		
2.	<p>TLO 2.1 Compare of types of boiler viz water tube & fire tube boiler with respective application in textile industries.</p> <p>TLO 2.2 Identify of all boiler mounting and their functioning.</p> <p>TLO 2.3 Explain on Advantages of condensers in steam power plant.</p> <p>TLO 2.4 Explain Requirements of a steam condensing plant.</p> <p>TLO 2.5 Explain on various types of condensers and its uses</p>	<p>Unit– II Steam Boilers & Condensers</p> <p>2.1 Steam Boiler: Classification, selection, important terms and essentials of a good steam boiler. Fire tube and water tube boiler such as Cochran, Lancashire, Cornish, Babcock and Wilcox boiler.</p> <p>2.2 Boiler mounting such as water level indicator, pressure gauge, blow-off cock, safety valve, fusible plug and accessories such as feed pump, super heater, and economizer. (Only simple idea and functions; no construction details. Only diagram).</p> <p>2.3 Introduction. Advantages of condensers in steam power plant.</p> <p>2.4 Requirements of a steam condensing plant.</p> <p>2.5 Classification of condensers and their comparison.</p>	<p>Improved Lecture, tutorial, Assignments, Demonstration, Simulation.</p>
3.	<p>TLO3.1 Explain refrigeration process.</p> <p>TLO3.2 Explain complete refrigeration process & components.</p> <p>TLO3.3 Explain air-conditioning, system for human comfort.</p> <p>TLO3.4 Identify Equipment's used in air conditioning cycle. & components of the system.</p> <p>TLO3.5 Awareness of Air conditioning systems and types.</p> <p>TLO3.6 Explain internal combustion engines.</p> <p>TLO3.7 Explain Main components of I.C.</p>	<p>Unit– III Refrigeration Airconditioning & I.C. Engines</p> <p>3.1 Introduction to air and vapour compression refrigeration.</p> <p>3.2 Mechanism of refrigeration.</p> <p>3.3 Introduction to air-conditioning. Factors of human comfort.</p> <p>3.4 Equipment used in air conditioning cycle.</p> <p>3.5 Air conditioning systems and types.</p> <p>3.6 Introduction to internal combustion engines.</p> <p>3.7 Main components of I.C. Engines. Sequence of operation.</p> <p>3.8 Two stroke cycle engine. Four stroke cycle engine.</p> <p>Advantages of two and four stroke</p>	<p>Improved Lecture, tutorial, Assignments, Demonstration, Simulation.</p>

	Engines. Sequence of operation. TLO3.8 Compare Two stroke cycle engine with Four stroke cycle engine. Write Advantages of two and four stroke cycle engine.	cycle engines	
SECTION II			
	TLO4.1 Define electromagnetism & associated rules & laws. TLO4.2 Classify basic measuring instruments into various categories. TLO4.3 Compare instruments used for measuring electromagnetic inductions.	Unit –IV Electromagnetic Induction & Measuring Instruments 4.1 Electromagnetism. Electromagnetic induction. Faraday’s laws, Lenz’s law, right hand rule and left hand rule. Right hand thumb rule. 4.2 Types of secondary instruments. Essentials of indicating instrument. 4.3 Moving iron instruments. Attractive type and repulsive type moving iron instruments. Moving coil instruments such as permanent magnet moving coil instruments.	
5	TLO5.1 Explain Simple single phase A.C. circuits containing resistance R, inductance L and capacitance C in series. & Combination of R-L-C. TLO5.2 Calculate three phase circuits. Star and delta connections for voltage, current. TLO5.3 Calculate power in single and three phase circuits. TLO5.4 Explain principle of D. C. Generator. & Working of D. C. Generator. TLO5.5 Explain parts and description & Types	Unit –V Alternating Current & Direct Current Cycles Component Circuits With Power 5.1 Alternating current. Frequency, amplitude, cycle, time period, Root Mean Square value (RMS value), average value, and vector representation of A.C. 5.2 Simple single phase A.C. circuits containing resistance, inductance and capacitance in series. Combination of R-L-C. Simple numerical examples. 5.3 Introduction to three phase circuits. Star and delta connections. 5.4 Measurement of power in single and three phase circuits, simple numerical examples. 5.5 Basic principle of D. C. Generator. Rectification. Working of D. C.	

	<p>of D. C. Generator.</p> <p>TLO5.6 Explain principle, construction and working of D. C. Motor.</p> <p>TLO5.7 Explain characteristic of D. C. Motors need of starter.</p> <p>TLO5.8 Classify D. C. Motors into various categories.</p>	<p>Generator.</p> <p>5.6 Practical D. C. Generator – parts and description. Types of D. C. Generator. Simple numerical examples.</p>	
6	<p>TLO6.1 Explain principle and working of Induction Motor.</p> <p>TLO6.2 Explain functions of various components of induction motor.</p> <p>TLO6.3 Explain principle and working of Transformer.</p> <p>TLO6.4 Solve Transformer Emf Equation and problems.</p>	<p>Unit-VI Induction motor & Transformer</p> <p>6.1 Construction of induction motor. Working principle of induction motor. Motor starter. Squirrel cage and phase wound rotor. Frequency of rotor current. $f' = s \cdot f$ simple numerical examples</p> <p>6.2 Transformer: Single phase ideal transformer. Construction of transformer.</p> <p>6.3 Emf equation of transformer. Emf equation of transformer Voltage regulation in transformer. Transformer tests. Losses in transformer. Efficiency of transformer. Transformer on load and on no load. Simple numerical examples on single phase transformer</p>	

VI LABORATORY LEARNING OUTCOMES AND ALIGNED PRACTICALS : NIL

VII SUGGESTED MICRO PROJECTS / ASSIGNMENTS/ACTIVITIES FOR SPECIFIC LEARNING/ SKIL DEVELOPMENT / SELF LEARNING -

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 Textile Composite Mill and visit the Engineering department. Study various utilities like Boilers, Condensers, Air conditioning units, Refrigeration units, compressors,
- (b) Visit Textile Composite Mill and visit and study various motors being used, repaired.
- (c) Visit Textile Mills and study the Generators and transformers being used
- (d) Visit textile process house and study boilers and condensers.
- (e) Solving the question banks from the text books.

SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning 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) Encourage students to refer different websites to have deeper understanding of the subject.
- (g) Observe continuously and monitor the performance of students in Sessional examination.
- (h) Assign unit wise assignments to group of 4 to 5 students for solving unit wise questions.
- (i) Use of video, animation films to explain concepts, facts and applications related to textile pretreatment.

SUGGESTED ASSIGNMENT

Only one assignment is planned to be undertaken by a student that needs to be assigned to him/hir in the beginning of the semester. In the first four semesters, the assignments are group-based, However, in the fifth and sixth semesters, in 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 application based, internet – based, workshop-base, laboratory-based or field-based. Each assignment 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 assignments 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) Write a detail note on application of zeroth law, first law of thermodynamics with example of each.

- (b) Explain with neat sketches P-V diagram for IC Engine (Petrol and diesel)
 (c) (Otto cycle and Diesel cycle)
 (d) Explain with sketch Boiler Mounting and Boiler Accessories
 (e) (list and use of boiler mountings and accessories)
 (f) Describe construction and working of Babcock and Wilcox Boiler with the help of neat labeled sketches on a full imperial size card board.
 (g) List and Explain Factor affecting human comfort.
 (h) Explain vapour compression refrigeration cycle.
 (i) Draw and explain type's auto diesel and duel cycle.
 (j) Explain statically induced emf and dynamically induced emf.
 (k) Explain different types of torques in measuring instruments.
 (l) Explain with neat sketch single phase elementary generator.
 (m) Explain the constructional details of D.C. machine and state the function of each part.
 (n) Draw equivalent circuit diagram of single phase transformer.
 (o) Draw and explain the power flow diagram of induction motor.

VIII LABORATORY MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED – NIL

IX SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. NO	Unit No.	Unit Title	Aligned Cos	LEARNING Hours	Distribution of Theory Marks			
					R Level	U Level	A Level	Total Marks
SECTION I								
1	I	Basic laws of thermodynamics and properties of steam	CO1	4	1	2	2	5
2	II	Steam boilers & Condensers	CO2	6	1	2	2	5
3	III	Refrigeration / air-conditioning & I. C. Engines.	CO3	6	2	2	3	7
		Total		16	4	6	7	17
SECTION II								
4	IV	Electromagnetic Induction and measuring instruments	CO4	3	1	1	2	4
5	V	A. C. /D.C motors / Generators & single phase & three phase circuits	CO5	10	2	3	5	10
6	VI	Induction motors & Transformers	CO6	3	1	1	2	4
		Total		16	4	5	9	18

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.

X ASSESSMENT METHODOLOGIES TOOLS

Formative Assessment (Assessment for learning)

- Two-unit test of 15 marks Tests
- Self-learning
- Seminar / Presentation

Summative Assessment (Assessment of Learning)

- End term assessment of 35 marks through online MCQ examination.

XI SUGGESTED CO-PO MATRIX FORM

Course Outcomes Cos	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life long learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	2	2	2	1	1	1	2	1	2
CO2	3	2	2	2	1	1	1	2	1	2
CO3	3	2	2	2	1	1	1	2	1	2
CO4	3	2	2	2	1	1	1	2	1	2
CO5	3	2	2	2	1	1	1	2	1	2
CO6	3	2	2	2	1	1	1	2	1	2
Legends :- High : 03, Medium : 02, Low : 01 , 0 : No mapping										
PSO 1:Perform preparatory, colouration and finishing of textiles using various relevant technologies.										
PSO 2:Perform Quality evaluation of textiles, fibres, yarns, Fabrics, Dyes and chemicals using various standard Test										
PSO 3: Maintain Various Textile machines to produce various types of quality textiles at optimum and sustainable cost										

XII SUGGESTED LEARNING RESOURCES

Sr. No.	Name of Book	Author	Publication
1	Mechanical Technology (Thermal Engineering)	R. S. Khurmi	S. Chand & Company Pvt. Ltd.
2	Applied Thermodynamics	Sarao & Rai	Satya Prakashan
3	Fundamentals of Electrical Engineering and Electronics	B. L. Theraja	S. Chand & Company Pvt. Ltd.
4	Elements of Electrical Engineering	B. R. Sharma	Acharya Book Depot
5	Worked Examples in Electrical Technology	B. L. Theraja	S. Chand & Company Pvt. Ltd.

XIII SUGGESTED SOFTWARE/ LEARNING WEBSITES

- <https://courses.lumenlearning.com/introchem/chapter/the-three-laws-of-thermodynamics/>
- https://en.wikipedia.org/wiki/Laws_of_thermodynamics
- <http://engineering.myindialist.com/2015/steam/#.Xfl3mpMza1s>
- https://www.slideshare.net/Arjun_Dedaniya/properties-of-steam-62226458
- <https://en.wikipedia.org/wiki/Boiler>
- <https://www.youtube.com/watch?v=02p5AKP6W0Q>
- [https://en.wikipedia.org/wiki/Condenser_\(heat_transfer\)](https://en.wikipedia.org/wiki/Condenser_(heat_transfer))
- <https://www.slideshare.net/saxenaankit2010/condenser-and-its-types>
- <https://nptel.ac.in/courses/112105129/>
- https://en.wikipedia.org/wiki/Air_conditioning
- <https://en.wikipedia.org/wiki/Refrigeration>
- <https://www.slideshare.net/8695/icengine-ppt>
- https://en.wikipedia.org/wiki/Internal_combustion_engine
- <https://www.youtube.com/watch?v=vIJ50aUiBgM>
- https://en.wikipedia.org/wiki/Electromagnetic_induction
- <https://www.electronics-tutorials.ws/electromagnetism/electromagnetic-induction.html>
- <http://www.emfs.info/what/measuring/>
- <https://www.toppr.com/guides/physics/magnetic-effects-of-electric-current/electromagnetic-induction-and-its-applications/>
- https://en.wikipedia.org/wiki/AC_motor
- <https://www.watelectrical.com/ac-motor-construction-working-types-applications/>
- https://en.wikipedia.org/wiki/DC_motor
- <https://www.youtube.com/watch?v=LAtPHANefQo>
- https://en.wikipedia.org/wiki/Electric_generator
- <https://economictimes.indiatimes.com/small-biz/productline/power-generation/electric-generator-an-basic-introduction-to-how-generators-work-their-features-and-applications/articleshow/69343338.cms?from=mdr>
- <https://www.elprocus.com/induction-motor-types-advantages/>
- https://www.youtube.com/watch?v=AQqyGNOP_3o

- <https://en.wikipedia.org/wiki/Transformer>.
- https://www.youtube.com/watch?v=vh_aCAHThTQ

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE

S. No.	Name and Designation	Institute	Contact No.	E-mail
1	H. V. Ramteke	Sasmira's Institute of Man-made Textiles, Mumbai	9766306847	hoddmtt@sasmira.edu.in

Fundamentals of ICT**C235207**

Program Name : Diploma in Textile Technology / Diploma in Textile Chemistry / Diploma in Knitting Technology

Program Code : TT / TC /KT

Semester : Second

Course Title : Fundamentals of ICT

Course code : C235207

I RATIONAL

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course isto develop the basic competency in students for using these office automation tools to accomplish the job. Thiscourse also presents an overview of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain.

II INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) Use computers for Internet services, Electronics Documentation, Data Analysisand Slide Presentation. 2) Appraise Application of ICT based Emerging Technologies.in different domain.

III COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning
 CO1 - Use computer system and its peripherals for given purpose
 CO2 - Prepare Business document using Word Processing Tool
 CO3 - Analyze Data and represent it graphically using Spreadsheet
 CO4 - Prepare professional Slide Show presentations
 CO5 - Use different types of Web Browsers and Apps
 CO6 - Explain concept and applications of Emerging Technologies

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Code	Course Title	Course Category	Learning Scheme					Credits	Paper Duration (hrs)	Assessment Scheme										Total Marks	
			Actual Contact Hrs/week			SLH	NLH			Theory				Based on LL and TSL		Based on SL					
			C	T	L					Total		Practical		SLA							
						L	L			L	FA-TH	SA-TH	Max	Min	FA-PR	SA-PR	Max	Min			
C235207	Fundamentals of ICT	SEC	0	0	3	1	3	1.5	0	0	0	0	0	0	0	0	2	1	0	0	25

Total IKS hours for semester: 0 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. * Self-learning hours shall not be reflected in the Time Table.
6. * Self-learning includes micro project/ assignment/ other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION I			
1	<p>TLO 1.1 Explain the functions of components in the block diagram of computer system.</p> <p>TLO 1.2 Classify the given type of software</p> <p>TLO 1.3 Explain characteristics of the given type of network</p> <p>TLO 1.4 Describe application of the given type of network connecting device</p> <p>TLO 1.5 Describe procedure to manage a file /folder in the given way.</p>	<p>Unit - I Introduction to Computer System</p> <p>1.1 Basics of Computer System: Overview of Hardware and Software: block diagram of Computer System, Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit</p> <p>1.2 Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)</p> <p>1.3 External Devices: Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive</p> <p>1.4 Application Software: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device</p>	Hands-on Demonstration Presentations

		<p>drivers, oper</p> <p>1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth</p> <p>1.6 Working with Operating Systems: Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.</p>	
2.	<p>TLO 2.1 Write steps to create the given text document.</p> <p>TLO 2.2 Explain the given feature for document editing.</p> <p>TLO 2.3 Explain the given page setup features of a document.</p> <p>TLO 2.4 Write the given table formatting feature. TLO 2.5 Write the steps to set the given type of document layout</p>	<p>Unit - II Word Processing</p> <p>2.1 Word Processing: Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, previewing a document, Saving a document, Closing a document and exiting application.</p> <p>2.2 Editing a Document: Navigate through a document, scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting</p> <p>2.3 Changing the Layout of a Document: Adjust page margins, change page orientation, create headers and footers, Set and change indentations, Insert and clear tabs</p> <p>2.4 Inserting Elements to Word Documents: Insert and delete a page break, insert page numbers, Insert the date and time, insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture</p> <p>2.5 Working with Tables: Insert a table, convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page</p>	<p>Hands-on Demonstration Presentations</p>

		2.6 Working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust	
3.	<p>TLO 3.1 Write steps to create the given spreadsheet.</p> <p>TLO 3.2 Explain the given formatting feature of a worksheet.</p> <p>TLO 3.3 Write steps to insert formula and functions in the given worksheet.</p> <p>TLO 3.4 Write steps to create charts for the given data set.</p> <p>TLO 3.5 Explain steps to perform data filter, sort and validation operations on the given data set.</p> <p>TLO 3.6 Write steps to setup and print a spreadsheet.</p>	<p>Unit - III Spreadsheets</p> <p>3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook.</p> <p>3.2 Editing Worksheet: Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze</p> <p>3.3 Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks, S</p> <p>3.4 Working with Formula: Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF.</p> <p>3.5 Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet.</p> <p>3.6 Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup</p>	Hands-on Demonstration Presentations

		options.	
SECTION II			
	<p>TLO 4.1 Write the steps to create the given slide presentation.</p> <p>TLO 4.2 Write the steps to insert multiple media in the given presentation.</p> <p>TLO 4.3 Explain the method of including animation, transition effects in slide show.</p> <p>TLO 4.4 Write steps to apply table features in the given presentation</p> <p>TLO 4.5 Write steps to manage charts in the given presentation</p>	<p>Unit - IV Presentation Tool</p> <p>4.1 Creating a Presentation: Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Prese</p> <p>4.2 Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format</p> <p>4.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications.</p> <p>4.4 Working with Charts: Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.</p>	<p>Hands-on Demonstration Presentations</p>
	<p>TLO 5.1 Explain use of the given setting option in browsers.</p> <p>TLO 5.2 Explain the given option used for effective searching in search engine TLO</p> <p>TLO 5.3 Explain features of the given web service.</p> <p>TLO 5.4 Explain concepts and applications of emerging technologies</p> <p>TLO 5.5 Use various elementary cloud-based tools.</p>	<p>Unit - V Basics of Internet and Emerging Technologies</p> <p>5.1 World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively for</p> <p>5.2 Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking</p> <p>5.3 Emerging Technologies: IOT, AI and ML, Drone Technologies, 3D Printing.</p> <p>5.4 Tools: Docs, Drive, forms, quiz, Translate and other Apps</p>	<p>Hands-on Demonstration Presentations</p>

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identify various Input/output devices, connections and peripherals of computer system LLO 1.2 Work with Computer System, Input/output devices, and peripherals for manages files and folders for data storage.	1	* a) Work with Computer System, Input/output devices, and peripherals. b)Work with files and folders	2	CO1
LLO 2.1 Create and manage word document. LLO 2.2 Apply formatting features on text at line, paragraph and page level.	2	*Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraphlevel formatting	2	CO2
LLO 3.1 Insert and edit images, shapes in a document file	3	Work with Images and Shapes in Word Processing.	2	CO2
LLO 4.1 Insert table and apply various tableformatting features on it.	4	*Work with tables in Word Processing.	2	CO2
LLO 5.1 Apply page layout features in wordprocessing. LLO 5.2 Print a document by applying various print options LLO 5.3 Use mail merge in word processing	5	*Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.	2	CO2
LLO 6.1 Enter and format data in a worksheet. LLO 6.2 Insert and delete cells, rows and columns LLO 6.3 Apply alignment feature on cell	6	*Create, open and edit Worksheet.	2	CO3
LLO 7.1 Create formula and "If" condition on cell data LLO 7.2 Apply various functions and named ranges in worksheet.	7	*Formulas and functions in Worksheet.	2	CO3
LLO 8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	8	*Sort, Filter and validate data in Spreadsheet.	2	CO3
LLO 9.1 Create charts using various chart options in spreadsheet.	9	*Charts for Visual Presentation in Spreadsheet.	2	CO3
LLO 10.1 Print the worksheet by applying various print options for worksheet	10	Worksheet Printing.	2	CO3
LLO 11.1 Apply design themes to the givenpresentation LLO 11.2 Insert pictures text/images/shapesin slide LLO 11.3 Use pictures text/images/shapes editing options.	11	*Make Slide Show Presentation.	2	CO4
LLO 12.1 Add tables and charts in the slides.				

LLO 12.2 Run slide presentation in different modes LLO 12.3 Print slide presentation as handouts/notes	12	*Use Tables and Charts in Slide	2	CO4
LLO 13.1 Apply animation effects to the text and slides LLO 13.2 Add/set audio and video files in the presentation.	13	*a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation	2	CO4
LLO 14.1 Configure internet connection on a computer system LLO 14.2 Use different web services on internet	14	a) Internet connection configuration b) Use Internet and Web Services.	1	CO5
LLO 15.1 Configure different browser settings LLO 15.2 Use browsers for the given purpose	15	Working with Browsers.	1	CO5
LLO 16.1 Create web forms for survey using different options.	16	*Prepare Web Forms for Survey.	1	CO5
LLO 17.1 Create web forms for Quiz using different options	17	*Prepare Web Forms for Quiz	1	CO5
Note : Out of above suggestive LLOs - <ul style="list-style-type: none"> • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes. 				

VII - SUGGESTED MICRO PROJECTS / ASSIGNMENTS / ACTIVITIES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

Self-Learning

Following are some suggestive self-learning topics: 1) Use ChatGPT/any other AI tool to explore information. 2) Use Calendar to Schedule and edit activities. 3) Use Translate app to translate the given content from one language to another. 4) Use cloud based storage drive to store and share your files.

Micro project

The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher. 1) Perform a survey on various input and output devices available in market and make its report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (Subject teacher shall assign a document to be prepared by each student) 3) Prepare slides with all Presentation features such as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher shall assign a presentation to be prepared by each student). 4) Student Marksheet, Prepare Pay bills, tax statement, student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student). 5) Carry-out Survey on different web browsers. 6) Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.

VIII – LABORATORY EQUIPMENTS / INSTRUMENTS / TOOL AND SOFTWARES REQUIRED.

Sr. No	Equipment Name with Borad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute)	All

IX SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS AND ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Applied Cos	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	I	Introduction to Computer System	CO1	2	0	0	0	0
2	II	Word Processing	CO2	3	0	0	0	0
3	III	Spreadsheets	CO3	3	0	0	0	0
4	IV	Presentation Tool	CO4	4	0	0	0	0
5	V	Basics of Internet and Emerging Technologies	CO5	3	0	0	0	0
				15	0	0	0	0

X ASSESSMENT METHODOLOGY /TOOLS**Summative Assessment (Assessment for learning)**

- Lab. Performance (Term work)

XI SUGGESTED CO-PO MATRIX FORM

Course Outcomes Cos	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life long learning	PSO -1	PSO -2	PSO -3
CO1	1	-	-	-	-	-	1	-	-	-
CO2	-	-	-	3	-	-	-	1	1	-
CO3	-	2	1	3	-	-	1	1	1	-
CO4	-	-	-	3	-	-	1	1	1	1
CO5	1	-	-	3	-	-	1	1	1	1

Legends: - High: 03, Medium: 02, Low: 01, 0: No mapping

PROGRAM SPECIFIC OUTCOMES (PSO's)

(What s/he will continue to do in the textile technology specific industry soon after diploma programme)

PSO 1: Perform spinning, weaving, Knitting and garmenting processes using various relevant technologies.

PSO 2: Execute designing and development of various textile products using various relevant technologies.

PSO 3: Maintain various textile machines to produce various types of quality textiles at optimum cost.

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr. No.	Author	Title	Publisher
1	Goel, Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller, Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro, Felix	Linux: Easy Linux for Beginners	CreatevSpace Independent Publishing

			Platform- 2016, ISBN-13: 978-1533683731
4	Johnson, Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN :9788131770641
5	Schwartz, Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN : 9788131766613
6	Leete, Gurdy, FinkelsteinEllen, Mary Leete	OpenOffice.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220

XIII LEARNING WEBSITES AND PORTALS

Sr. No.	Links / Portals	Description
1	https://www.microsoft.com/en-in/learning/office-training.aspx	Office
2	http://www.tutorialsforopenoffice.org/	Open Office
3	https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf	Open Office
4	https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf	Computer Fundamental
5	http://www.tutorialsforopenoffice.org/	Open Office
6	https://www.tutorialspoint.com/computer_fundamentals/index.htm	Computer Fundamental
7	https://www.tutorialspoint.com/word/	Word Processing
8	https://www.javatpoint.com/ms-word-tutorial	Word Processing
9	https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847	Word Processing
10	https://www.javatpoint.com/excel-tutorial	Spreadsheet
11	https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb	Spreadsheet
12	https://www.javatpoint.com/powerpoint-tutorial	Powerpoint Presentation
13	https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b	Powerpoint Presentation
14	https://www.geeksforgeeks.org/ms-dos-operating-system/	Operating System
15	https://www.javatpoint.com/windows	Windows Operating System
16	https://www.javatpoint.com/what-is-linux	Linux Operating System
17	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT	IoT
18	https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/	IoT
19	https://www.javatpoint.com/machine-learning	AI & Machine Learning
20	https://www.skillrary.com/blogs/read/introduction-to-drone-technology	Drone Technology
21	https://www.cnet.com/tech/computing/what-is-3d-printing/	3D Printing
22	https://support.google.com/a/users/answer/9389764?hl=en	Apps

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

Sr. No	Name & Designation	Institute	Contact No.	Email ID
1.	Mr. S.S. Joglekar Sr. Lecturer (Selection Grade)	Sasmira's Institute of Man-made Textiles, Worli, Mumbai – 30.	9833909871	shirishjoglekar@sasmira.edu.in

Program Name: Diploma in Textile Technology

Program Code: TT

Semester: Second

Course Title: Spinning_Preparatory_Processes

Course code: T231201

I RATIONAL

In spinning, the knowledge of spinning preparatory processes is of prime importance to manufacture yarn from fibres. The opening, cleaning, mixing, parallelisation, drafting of fibres affects on properties of yarn produced in spinning, and furthermore, it affects fabric properties. So, it is essential for textile technologists to learn the principles of spinning preparatory machines involved in Blow room, Carding, Draw frame etc. This course describes basic facts, concepts, and principles of opening, cleaning and orientation of fibres. This course is designed to prepare diploma engineers to apply the basic knowledge of ginning. Blow room, carding, draw frame to control the process and solve problems in spinning preparatory department.

II INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

Apply knowledge of spinning preparatory processes to produce even and quality output at each preparatory stage.

III COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1- Use cotton cultivation and harvesting process to produce raw material for spinning

CO2- Use ginning and baling machines to convert raw cotton to bale

CO3- Use different blow room machines for opening, cleaning and mixing of fibres.

CO4- Use different methods of lap preparation to produce lap for carding.

CO5- Use of carding machine for individualisation and cleaning of fibres and for production of card sliver.

CO6- Use of drawframe machine for production of even drawframe sliver for the next process. .

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category	Learning Scheme					Credits	Paper Duration (hrs)	Assessment Scheme										Total Marks
				Actual Contact Hrs/ week			SLH	NLH			Theory			Based on LL and TL				Based on SL			
				CL	LL	TL					FA-TH	SA-TH	Total		Practical		SLA				
							Max	Max					Max	Min	Max	Min	Max	Min	Max	Min	
T231201	Spinning Preparatory Processes	SPP	DSC	2	3	1	1	7	3.5	3	30	70	100	40	25	10	25	10	25	10	175

Total IKS hours for semester: 2 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

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3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. * Self learning hours shall not be reflected in the Time Table.
6. * Self learning includes micro project/ assignment/ other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Unit No.	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION-I			
Unit I- Introduction to textile fibres and cotton cultivation	<p>TLO-1.1 Elaborate on textile fibre classification and characteristics of spun and filament yarn.</p> <p>TLO 1.2 Describe the cultivation of cotton and its varieties in India.</p> <p>TLO 1.3 Describe Essential and desirable properties of fibres.</p> <p>TLO 1.4 Explain the yarn numbering systems. Related calculations.</p>	<p>1.1 Textile fibres: Definition, classification. Natural and man-made fibres.</p> <p>1.2 Essential and desirable properties of fibres.</p> <p>1.3 Cultivation and harvesting of cotton in India. Different cotton varieties cultivated in India.</p> <p>1.4 Yarn numbering system- – Introduction, Importance, Direct and Indirect yarn numbering systems. Related calculations.</p>	Chalk-Board , Video, Demonstrations, internet, Industry Visit etc.
Unit – II Ginning and baling	<p>TLO- 2.1 Draw and understand the flowchart for conversion of cotton fibers to carded and combed yarns.</p> <p>TLO-2.2 Elaborate on Picking and Ginning. Process.</p> <p>TLO-2.3 Necessity of Pre-ginning treatment.</p> <p>TLO-2.4 Describe the Construction and working of different types of ginning machine.</p> <p>TLO-2.5 Explain the need of baling.</p>	<p>2.1 Flow chart for conversion of cotton fibers to carded and combed yarns. Objects, input, and output of each process.</p> <p>2.2 Picking and Ginning.</p> <p>2.3 Pre-ginning treatment</p> <p>2.4 Types of ginning machines – Construction and working of different types of ginning machine .</p> <p>2.5 Baling of cotton- Bale sizes and density.</p>	Chalk-Board , Machines Video, Demonstrations, internet, Industry Visit etc.
Unit – III	<p>TLO-3.1 State the objectives of blowroom.</p>	<p>3.1 Objectives of blowroom</p> <p>3.2 Conditioning of bale cotton</p>	Chalk-Board , Machines Video,

Blowroom	<p>TLO-3.2 Necessity of conditioning in blowroom.</p> <p>TLO-3.3 Explain the basic operations in blowroom.</p> <p>TLO-3.4 Explain the basic components of blowroom machines.</p> <p>TLO-3.5 Explain the factors affecting the opening and cleaning.</p> <p>TLO-3.6 Suggest the sequence of machines in the blowroom line.</p> <p>TLO-3.7 Describe the construction and working of various blowroom machineries.</p>	<p>in blowroom</p> <p>3.3 Basic operations in blow room- opening, cleaning, mixing/blending and even feed of material to the card..</p> <p>3.4 Components of blowroom machines:- Feed apparatus, opening devices, the grid etc.</p> <p>3.5 General factors affecting opening and cleaning.</p> <p>3.6 Sequence of machines in conventional blow room line, minor and major cleaning points.</p> <p>3.7 Construction and working of blowroom machines- Hopper bale breaker, step cleaner , Axi flow, Monocylinder cleaner,ERM cleaner, Shirley opener, unimix, blendomat, Dustex etc.</p>	<p>Demonstrations, internet, Industry Visit etc.</p>
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SECTION-II

<p>Unit – IV</p> <p>Blowroom lap formation and production calculations</p>	<p>TLO-4.1 Explain Bladed beaters, cages and lap formation.</p> <p>TLO-4.2 Explain the blowroom cleaning efficiency.</p> <p>TLO-4.3 Explain the processing of man-made fibres and blends.</p> <p>TLO-4.4 State the features of modern blowroom line.</p> <p>TLO-4.5 Importance of accessories and auxiliary equipments.</p> <p>TLO-4.6 State the defects in the blowroom line.</p> <p>TLO-4.7 Calculate the production of blowroom .</p>	<p>4.1 Bladed beaters , cages and lap formation.</p> <p>4.2 Blowroom Cleaning efficiency</p> <p>4.3 Processing of man-made fibres and blends.</p> <p>4.4 Features of Modern blowroom line.</p> <p>4.5 Accessories and auxiliary equipment-metal extractors, waste disposal ,</p> <p>4.6 Defects in blowroom lap</p> <p>4.7 Blowroom production calculations</p>	<p>Chalk-Board , Machines Video, Demonstrations, internet, Industry Visit etc.</p>
<p>Unit – V-</p> <p>Carding</p>	<p>TLO-5.1 Draw and understand the passage of material through the card.</p> <p>TLO-5.2 Explain feed section of card with its construction and function.</p> <p>TLO-5.3 Explain Carding section of card</p>	<p>5.1 Objective of card, passage of material through card.</p> <p>5.2 Feed section of card – Construction and function of feed roller, feed plate, licker-in, mote knives, licker-in</p>	<p>Chalk-Board , Machines Video, Demonstrations, internet,</p>

	<p>with its construction and function.</p> <p>TLO-5.4 Explain feed section of doffer section with its construction and function.</p> <p>TLO-5.5 Explain the importance of card clothing and its types</p> <p>TLO-5.6 Select various settings of parts of carding machine.</p> <p>TLO-5.7 Explain the concept of stripping, grinding and burnishing.</p> <p>TLO-5.8 Explain the concept of autolevelling in the carding.</p> <p>TLO-5.9 State the causes and remedial action for various defects in card sliver.</p> <p>TLO- 5.10 State Modern developments at card.</p> <p>TLO-5.11 Suggest the changes to be made for processing of man-made fibers and their blends.</p> <p>TLO-5.12 Calculations related to carding production.</p>	<p>undercasing and back plate.</p> <p>5.3 Carding section- Construction and function of cylinder, flats, cylinder under casing, flat stripping comb, front plate, mounting and clothing</p> <p>5.4 Doffer section – Construction and working of Doffer, doffer comb, calendar rollers, coiling of sliver into can.</p> <p>5.5 Card clothing</p> <p>5.6 Settings on carding machine and their importance.</p> <p>5.7 Maintenance- Stripping, Grinding, Burnishing.</p> <p>5.8 Autolevelling in carding</p> <p>5.9 Defects in card sliver –causes and remedies.</p> <p>5.10 Modern developments at card.</p> <p>5.11 Processing man-made fibers and their blends.</p> <p>5.12 Calculations regarding speeds, draft and production.</p>	<p>Industry Visit etc.</p>
<p>Unit – VI</p> <p>Drawframe</p>	<p>TLO-6.1 State the objectives of draw frame and explain the passage of cotton through Draw frame.</p> <p>TLO-6.2 Explain the Operating devices on drawframe machine with their functions.</p> <p>TLO-6.3 Explain the concept of draft and explain the Draft distribution ,Diameter of Rollers and their settings, roller weighing systems.</p> <p>TLO-6.4 Explain the need of Autoleveller in draw frame.</p> <p>TLO-6.5 State the Modern developments in draw frame.</p> <p>TLO- 6.6 Explain the faults in Draw frame..</p> <p>TLO-6.7 Predict the Changes to be made at draw frame for processing man-made</p>	<p>6.1 Objectives of draw frame, passage of cotton through Draw frame.</p> <p>6.2 Operating devices- creel, Drafting systems, bottom roller, top roller, Cots, Trumpet and coiling,</p> <p>6.3 Concept of draft, Draft distribution, Diameter of Rollers and their settings, roller weighing systems.</p> <p>6.4 Autoleveller in draw frame.</p> <p>6.5 Modern developments in draw frame.</p> <p>6.6 Faults in Draw frame..</p> <p>6.7 Changes to be made at draw frame for processing man-made fibers.</p> <p>6.8 Calculations regarding hank, draft</p>	<p>Chalk-Board , Machines Video, Demonstrations, internet, Industry Visit etc.</p>

	fibers. TLO-6.8 Calculate hank, draft and production of draw frame machine.	and production.	
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VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identification of fibres LLO 1.2 Compare natural and man made fibres LLO 1.3 Determine the count of the yarn.	1	Use of burning test for identification of fibres.	3	CO1
	2	Use of wrap reel to determine the count of the yarn.	3	CO1
LLO 2.2 Draw process flow chart for manufacturing of carded yarn. LLO 2.3 Draw process flow chart for manufacturing of combed yarn. LLO 2.3 Draw the line diagram of saw ginning machine LLO 2.4 Draw the line diagram of Macarthy ginning machine.	3	*Observe the all spinning sequence process to identify the correct material flow sequence for manufacturing of carded yarn.	3	CO2
	4	*Observe the all spinning sequence process to identify the correct material flow sequence for manufacturing of combed yarn	3	CO2
	5	*Use the Saw gin machine for separation of fibres from seed.	3	CO2
	6	*Use the Macarthy gin machine for separation of fibres from seed.	3	CO2
LLO 3.1 Draw the line diagram of Hopper bale breaker machine LLO 3.2 Draw the line diagram of Step cleaner machine. LLO 3.3 Draw the line diagram of Axi flow cleaner machine. LLO 3.4 Draw the line diagram of ERM cleaner machine	7	* Use of opening machines of blowroom for fibre opening .	3	CO3
	8	* Use of cleaning machines of blowroom for fibre cleaning.	3	CO3
	9	* Identify the various parts Of the machine.	3	CO3
LLO 4.1 Draw the line diagram of Kirschner beater machine	10	. *Use lap formation machine for conversion of fibres into the lap.	3	CO4
LLO 5.1 Draw the line diagram of carding machine. LLO 5.2 Illustrate the passage of material through carding machine. LLO 5.03 Draw the line diagram of chute feed system of carding machine.	11	* Use Carding machine for individualization of fibres and cleaning.	3	CO5
	12	* Identify the various parts and gearing Of the carding machine.	3	CO5
	13	*Select the correct material transport system from blowroom to carding.	3	CO5

1	I	Introduction to textile fibres and cotton cultivation	CO1	2	2	2	3	07
2	II	Ginning and baling	CO2	4	2	2	6	10
3	III	Blowroom	CO3	8	2	6	8	18
4	IV	Blowroom lap formation and production calculations	CO4	4	2	4	5	9
5	V	Carding	CO5	6	4	4	6	14
6	VI	Draw frame	CO6	6	4	2	6	12
				30	16	20	34	70

X ASSESSMENT METHODOLOGY /TOOLS

Formative assessment (Assessment for Learning)

Mid Term Test,

Micro Projects and assignments

Rubrics

Each practical will be assessed considering 60% weightage to process and 40% weightage to product.

Summative Assessment (Assessment of Learning)

End Term Examination

Laboratory Performance

XI SUGGESTED CO-PO MATRIX FORM

Course Outcomes	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Lifelong learning	PS O-1	PS O-2	PS O-3
CO1	3	1	-	2	-	-	2	3	-	1
CO2	3	1	1	2	-	-	2	3	1	2
CO3	3	1	1	2	-	-	2	3	1	2

CO4	3	2	2	-	-	-	2	3	2	-
CO5	3	2	2	-	-	-	1	3	2	-
CO6	3	2	1	1	1	1	1	-	-	2

Legends: - High: 03, Medium: 02, Low: 01, 0: No mapping

PROGRAM SPECIFIC OUTCOMES (PSO's)

(What s/he will continue to do in the textile technology specific industry soon after diploma programme)

PSO 1: Perform spinning preparatory processes using various relevant technologies.

PSO 2: Supervise the production in Blow room, Carding and Draw frame processes.

PSO 3: Maintain various spinning preparatory machineries particularly Blow room, Carding and Draw frame .

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr. No.	Author	Title	Publisher
1	Klein Werner	The Technology of short staple spinning	The Textile Institute ISBN : 1 87081298 8
2	Klein Werner	A Practical Guide to the Blowroom and carding	The Textile Institute,Manchester,1987 ISBN: 1870812999
	Klein Werner	A Practical Guide to Combing and Drawing	The Textile Institute,Manchester,1987 ISBN: 0-900739932
3	Eric Oxberg	Spun Yarn Technology	Butterworths (Publishers) Limited, 1983, ISBN :0-408014644
4	Cotton Spinning	K. Ganesh, A.R.Garde	Textile Association of India,Ahmedabad.
5	Essential Elements of Blow room	Dr. A. R. Khare	Sai Book Centre,Mumbai
6	Elements of Carding and Drawing	Dr. A. R. Khare	Sai Book Centre,Mumbai

XIII LEARNING INTERNET AND PORTALS

Sr. No.	Links / Portals	Description

1	https://cottonworks.com/en/topics/sourcing-manufacturing/fiber-science/cotton-fiber-harvesting-and-ginning/	Cotton harvesting
2	https://kvk.icar.gov.in/API/Content/PPupload/k0447_7.pdf	Cotton cultivation
3	http://www.textileschool.com/articles/109/blow-room-functions	Blow Room Function
4	https://en.wikipedia.org/wiki/Cotton_gin	Cotton Ginning Process
5	http://nptel.ac.in/courses/116102005/48	Over all textile manufacturing process
6	http://nptel.ac.in/courses/116102005/49	Over all textile manufacturing process
7	http://gluedideas.com/Encyclopedia-Britannica-Volume-6- Part-2-Colebrooke-Damascius/Cotton-Ginning	Cotton ginning methods
8	http://www.rieter.com/cz/rikipedia/articles/rotor-spinning/applications-engineering/preparation-of-r	cotton spinning system

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE
Faculty Members from Polytechnics

Sr. No	Name & Designation	Institute	Contact No.	Email ID
1.	Mrs. S.V. Raut Lecturer	Sasmira's Institute of Man-made Textiles, Worli, Mumbai – 30.	9892542736	saritaraut@sasmira.edu.in

Programme Name: Diploma in Textile Technology/Diploma in Knitting Technology

Programme Code : DTT/DKT

Semester : SECOND

Course : Fundamentals of Wet Processing

Course Code : T233203

I RATIONALE:

Diploma engineers have to work at various levels in textile industry as shift supervisor to marketing head. To solve the textile manufacturing related problems, they should have a basic knowledge of each stage of textile production starting from fibre production up to garment manufacturing. This course develops necessary skills in using the chemicals which are used during pre-treatments process for improving absorbency and whiteness of fabrics. This course also gives the basic knowledge about dyeing, printing and finishing processes of textile which improves the aesthetic value of textile substrate.

II INDUSTRY/EMPLOYER EXPECTED OUTCOME

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 chemical wet processing in textile manufacturing.”

III COURSE LEVEL LEARNING OUTCOMES (CO'S)

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:

(CO 1) Use principles of pre-treatment of fabrics in textile manufacturing

(CO 2) Use relevant methods for bleaching treatments of fabrics.

(CO 3) Use relevant method for dyeing of textile fabrics fabrics.

(CO 4) Use basic methods of printing of textiles fabrics

(CO 5) Choose relevant finishing process according to the end uses.

(CO 6) Select relevant evaluation of fastness properties and fibre identification methods.

IV TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Code	Course Title	Course Category	Learning Scheme					Credits	Assessment Scheme										Total Marks	
			Actual Contact Hrs/ week			SLH	NLH		Paper Duration (hrs)	Theory				Based on LL and TSL				Based on SL		
			CL	T L	L L					FA-TH	SA-TH	Total		Practical		SLA				
						Max	Min					Max	Min	Max	Min		Max	Min		
T233203	FUNDAMENTALS OF WET PROCESSING	DS E	2	-	3	1	6	3	3	30	70	100	40	25	10	25	10	25	10	175

Total IKS hours for semester: 02 Hrs.

Abbreviations: CL- Class room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA- Formative Assessment, SA-Summative assessment, IKS - Indian Knowledge System, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

FA-TH represents average of two class tests of 30 marks each conducted during the semester.

1. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
2. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
3. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
4. One credit is equivalent to 30 Notional hrs.
5. * Self-learning hours shall not be reflected in the Time Table.
6. * Self-learning includes micro project/ assignment/ other activities.

V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLOs) aligned to Cos	Learning content mapped with Theory Learning Outcomes (TLOs) and (Cos)	Suggested Learning Pedagogies.
SECTION I			
1	<p>TLO 1.1 introduction to wet processing</p> <p>TLO 1.2 Describe with sketches the features of the given system</p> <p>TLO 1.3 Describe with sketches the procedure to carry out the given type of desizing.</p> <p>TLO 1.4 Describe the scouring process for textile fabrics</p> <p>TLO 1.5 Describe with sketches the procedure to carry out given type of Scouring with machines.</p> <p>TLO 1.6 Explain the importance of mercerisation process.</p>	<p>Unit – I Basics of Pretreatments</p> <p>1.1 Process flow chart for wet processing of textiles, Grey inspection process</p> <p>1.2 Shearing and cropping process: Objective and process</p> <p>1.3 Singeing process and gas singeing machine.</p> <p>1.4 Desizing process: Acid desizing, enzyme desizing, Batch wise and Continuous process of desizing.</p> <p>1.5 Scouring process: vertical pressure kier and J-box system</p> <p>1.6 Mercerization: factors affecting the process of mercerization, Machine used for mercerization.</p>	<p>Lectures, Presentations, Assignments, Practical, YouTube simulation.</p>
2.	<p>TLO 2.1 Explain with sketches the procedure for bleaching of the given type of fibre.</p> <p>TLO 2.2 Explain with sketches the procedure for continuous processing of the given type of blend</p> <p>TLO 2.3 Explain with sketches the Batch wise bleaching process</p>	<p>Unit– II Bleaching of Textile fibres</p> <p>2.1 objective and importance of bleaching process</p> <p>2.2 Bleaching process with sodium chlorite, sodium hypochlorite and H₂O₂ bleaching.</p> <p>2,2Batch wise and continuous methods of bleaching</p>	<p>Lectures, Presentations, Assignments, Practical, YouTube simulation.</p>

	TLO 2.4 Explain the process parameters for bleaching of cellulose and blends TLO 2.5 Suggest the method of evaluation of bleached fabric	2.3 Machines used for bleaching: Jiggers, winch, soft flow, continuous bleaching range. 2.4 Bleaching of cellulose and blends 2.5 Evaluation of bleaching efficiency of bleached fabrics.	
3.	TLO 3.1 Explain the principle of dyeing TLO 3.2 Describe with sketches for Dyeing of given type of Cellulosic fibre. TLO 3.3 Describe with sketches the given type of dyeing method with procedures TLO 3.4 Describe with sketch the principle and working of Dyeing Machineries. TLO 3.5 Explain the comparison between batch-wise and continuous dyeing machines. TLO 3.6 Explain ancient method used for dyeing of cellulosic fibres.	Unit III – Dyeing of Textile fibres 3.1 Colouring matter: classification of dyes. 3.2 Classification, Methods of application and after treatments of Direct, Reactive, Vat dyes etc. 3.3 Disperse dyes: dyeing mechanism, Carrier dyeing, HTHP dyeing process of Polyester 3.4 Dyeing processes, process parameters, faults and remedies. 3.5 Machines for dyeing: batch wise and continuous and comparison 3.6 Ancient dyeing method: dyeing cellulose with natural colors	Lectures, Presentations, Assignments, Practical, YouTube simulation.
SECTION --II			
04	TLO 4.1 Describe with sketches the procedure for of the given method of printing. TLO 4.2 Describe the features of the given style of printing. TLO 4.3 Describe with sketches the construction of given type of printing machine TLO 4.4 Describe with sketches the procedure for printing of the given type of fabric sample TLO 4.5 Describe with sketches the procedure for of the given method of printing. TLO 4.6 Describe the features of the given style of printing. TLO 4.7 Describe with sketches the construction of given type of printing machine.	Unit IV – Basic concepts of printing 4.1 Printing: objective, Methods and Styles of Printing Fixation of printed textiles 4.2 Screen printing: Flatbed screen printing m/c. and its various parts. Technical features of printing with Flat - bed printing m/c. . Rotary screen printing m/c. and its various parts. Squeeze system. Technical features of rotary printing machine. 4.3 Printing with direct dye :Print paste, ingredients for direct and discharge style of printing 4.4 Printing with reactive dyes: Print paste ingredients for direct, discharge and resist style of printing. 4.5 Pigments printing: mechanism and method of printing.	Lectures, Presentations, Assignments, Practical, YouTube simulation.
05	TLO 5.1 Describe the features of the given type of finishing machinery. TLO 5.2 Describe with sketches the mechanism of the given type of	Unit V – Basic concepts of finishing 5.1 Finishing: objective of textile finishing, classification of finishing	Lectures, Presentations, Assignments, Practical, You-

	finishing TLO 5.3 Describe with sketches the given type of softening treatment TLO 5.4 Describe with sketches the mechanism of flame retardent finishing for the given type of fabrics. TLO 5.5 Select appropriate softener/stiffeners for required finish.	5.2 Finishing machinery : Calendaring, Decatising , VDR , Sanforising, Stenter etc 5.3 Resin finishing :Mechanism of creasing and resin finishing, Types of resin finishing, methods of application 5.4 Flame retardant finishing: Concept of flame proof and flame retardancy. Limiting oxygen Index and its importance, Thermal behaviour of textile fibres. 5.5 Softening and stiffening treatments: classification of softeners, Properties, application of softener.	tube simulation.
06	TLO 6.1 6a. Explain various methods for Identification of textile fibres. TLO 6.2 Describe with procedures the objectives of fastness properties. TLO 6.3 Explain methods of assessment of fastness properties	Unit VI – Fibre identification and Blend analysis 6.1 Methods of fibre identification: Burning test and solubility test. 6.2 Fastness properties –light ,rubbing, washing, sublimation, etc. 6.3 Blend analysis method-physical and chemical.	Lectures, Presentations, Assignments, Practical, You-tube simulation.

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr. No.	Laboratory Experiment / Practical Title / Tutorial Title	No. of Hours	Relevant COs
LLO 1.1 Identify various apparatus and glassware used for practical. LLO 1.2 Select suitable apparatus and glassware for the practical execution. LLO 1.3 Use relevant apparatus and glassware for the practical execution and understand the effect of change in finish on cotton fabric.	1	Desize the given grey cotton fabrics by using acid/enzyme.	03*	CO1
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of after treatments on dyed of cotton.	2	Scour the given cellulosic and synthetic fabrics.	03*	CO1
LLO 2.1 Identify various apparatus and	3		3	CO2

<p>glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different concentrations of exhausting agents on dyeings of cotton.</p>		Bleach the given cotton fabric by using sodium hypochlorite.		
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different MLR on dyeing of cotton.</p>	4	Bleach the given cellulosic and synthetic fabrics by using H ₂ O ₂	3	CO ₂
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different concentration of fixing agents on dyeing of cotton.</p>	5	Bleach the given cellulosic and synthetic fabrics by using hydrogen peroxide.	3	CO ₂
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.</p>	6	Dye the given fabric sample by using direct dyes.	03*	CO ₃
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.</p>	7	Dye the given fabric sample by using reactive dyes.	3	CO ₃
<p>LLO 2.1 Identify various apparatus and glassware used for practical.</p> <p>LLO 2.2 Select suitable apparatus and glassware for the practical execution.</p> <p>LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.</p>	8	Dye the given polyester/nylon fabric with disperse dyes by using H.T.H.P./ Carrier dyeing method	3	CO ₃
LLO 2.1 Identify various apparatus and	9		3	CO ₄

glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.		Dye the given acrylic fabric by using cationic dyes.		
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	10	Print the given fabric sample by direct style of printing by using direct dyes	3	CO6
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	11	Print the given fabric sample by discharge styles of printing by using reactive dyes.	3	CO6
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	12	Print the given fabric sample by discharge styles of printing by using reactive dyes	3	CO5
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	13	Print the given fabric sample by pigment printing method.	3	CO4
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	14	Carry out soft finish on the given fabric samples	3	CO5
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and	15		3	CO6

glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.		Carry out Blend analysis of given fabric		
LLO 2.1 Identify various apparatus and glassware used for practical. LLO 2.2 Select suitable apparatus and glassware for the practical execution. LLO 2.3 Use relevant apparatus and glassware for the practical execution and understand the effect of different dye class on dyeing of cotton.	16	Carry out Washing fastness test of colored fabrics	3	CO6

VII - SUGGESTED MICRO PROJECTS / ASSIGNMENTS / ACTIVITIES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

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:

- (a) Market survey of different processed fabrics and compare the following points.
 - ❖ construction and type of weave
 - ❖ processes carried out
 - ❖ Applications of the given fabric.
- (b) Visit any synthetic process house nearby to your house and take the help of processing in-charge to know the various processes.
- (d) Write report on visit to dye house and compare the existing process conditions.
- (e) Read the safety precautions of various chemicals and machinery used in process house.
- (f) Do internet survey and prepare chart of various finishes, chemicals and machines in market.
- (g) Guide student(s) in undertaking micro-projects.
- (h) Library/ Internet survey of developments in all fibre finishing.
- (i) Prepare power point presentation for understanding various finishing processes
- (j) Understand faults in dyeing and find relevant remedies.
- (k) Understand good work practices in synthetic fabric dyeing.

SUGGESTED ASSIGNMENTS –

A suggestive list is given here. Similar ASSIGNMENTS could be added by the concerned faculty:

- (a) Pretreatments: Prepare models to demonstrate Fundamental methods of desizing, scouring, bleaching, mercerization and OBA treatment.
- (b) Dyeing and Printing: Prepare models to demonstrate Fundamental methods of Dyeing & printing of different textile fibre varieties with different class of dyes and machines
- (c) Finishing & Testing: Prepare models to demonstrate Fundamental methods of

finishing processes, chemicals and machineries, testing of textiles for different test parameters.

VIII – LABORATORY EQUIPMENTS / INSTRUMENTS / TOOL AND SOFTWARES REQUIRED.

Sr. No	Equipment Name with Borad Specifications	Relevant LLO Number
1	Padding mangle machine, pots each with 250 / 500 ml. capacity.	1, 2,3, 4, 5, 6
2	Water bath with steel dye pots with 250 / 500 ml. capacity.	7,8,9, 10,11,12, 13,14,15
3	Drying, Curing & Setting Chamber (Oven), Max. Temperature -200°C	All
4	Electronic balance with 0.001gm accuracy, capacity 300 gm.	All
5	Glassware – Watch glass, Beaker, Glass rod, Pipette, cylinders etc.	All
6	Relative finishing agents samples and chemicals	All

IX SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTES AND ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Applied Cos	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	I	Basics of pretreatment processes	CO1	10	6	4	4	14
2	II	Bleaching of regenerated and synthetic fibres	CO2	06	5	3	2	10
3	III	Dyeing of Textile fibres	CO3	08	5	3	3	11
4	IV	Basic concepts of printing	CO4	09	6	4	3	13
5	V	Basic concepts of finishing	CO5	10	6	4	4	14
6	VI	Fibre identification & blend analysis	CO6	05	4	2	2	08
				48	32	20	18	70

X. ASSESSMENT METHODOLOGY /TOOLS

Formative Assessment (Assessment for learning)

- Lab. Performance (Term work)

Summative Assessment (Assessment of Learning)

- End of Term examination – Practical Exam and Viva-voce

XI . SUGGESTED CO-PO MATRIX FORM

Course Outcomes	Program Outcomes (Pos)							Program Specific Outcomes (PSOs)*		
	PO-1 Basic & Discipline specific knowledge	PO-2 Problem Analysis	PO-3 Design Development of solutions	PO-4 Engineering tools	PO-5 Engineering practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life long learning	PSO -1	PSO -2	PSO -3
CO1	2	2	3	1	1	1	2	2	3	3
CO2	2	2	3	1	1	1	2	2	3	3
CO3	2	2	3	1	1	1	2	2	3	3
CO4	2	2	3	1	1	1	2	2	3	3
CO5	2	2	3	1	1	1	2	2	3	3
CO6	2	2	3	1	1	1	2	2	3	3

Legends: - High: 03, Medium: 02, Low: 01, 0: No mapping

PROGRAM SPECIFIC OUTCOMES (PSO's)
(What s/he will continue to do in the textile and related industry soon after diploma programme)

PSO 1: Perform preparatory, Colouration and Finishing of Textiles using various relevant technologies.

PSO 2: Perform Quality identification,evaluation of textiles, Fibres, Yarns, Fabrics, Dyes and Chemicals using various standard test methods.

PSO 3: Maintain various textile machines to produce various types of quality textiles at optimum and sustainable cost.

XII SUGGESTED LEARNING RESOURCES / BOOKS

Sr. No.	Author	Title	Publisher
1	Datya .K.V & Vaidya .A.A	Chemical processing of synthetic and its blends	A wiley inter science publication ISBN-0901956740 ,1984
2	Trotman, E. R. T.	Dyeing and chemical Technology of Textile Fibres	John willey and Sons Inc, 1985 ISBN: 978-0471809104
3	Shenai, V.A	Fundamental Principles of Textile Processing	Sevak Publications, Bombay, 1984 <i>ISBN 13: 9783659686047.</i>
4	Clarke, W.	An Introduction to Textile Printing	CBS Publishers and Distributors Pvt. Ltd., New Delhi 2004; ISBN: 9781855739949
5	Gulrajani, M. L.	Silk Dyeing printing and finishing	BPB Publications, New Delhi 2016, ISBN:978-8183331630

6	Grover, E.B; Hamby, D.C.	Hand book of Textile Testing & Quality Control	John Wiley & Sons Inc., 1960, ISBN: 9780470329016
7	Hurst, George and Henry	Silk Dyeing, Printing and Finishing	Ratebooks club.com,2012 ISBN-9781130986525
8	Amutha K.	A Practical Guide to Textile Testing	Wood Head Publishing, New Delhi, 2016. ISBN: 9789385059070
9	Basak Anindita	Environmental Studies	Pearson education
10	Heywood	Textile Finishing	<i>SDC Publications</i> <i>ISBN-9780901950811</i>
11			

XIII LEARNING WEBSITES AND PORTALS

Sr. No.	Links / Portals	Description
1	Textilelearner.blogspot.in/2011/03/description-of-textile-finishing_1796.html	
2	Textilelearner.blogspot.in/2012/03/textile-softening-fabric-softening.html	
3	www.onlineclothingstudy.com/2015/11/mechanical-finishes-textiles.html	
4	Textileapex.blogspot.in/2015/03/resin-finishing-importance.html	
5	Textilelearner.blogspot.in/2011/05/description-of-optical-brightening_4142.html	
6	www.teonline.com/knowledge-centre/flame-retardants.html	
7	Textilelearner.blogspot.com/printing-method-method-of-printing	
8	www.tikp.co.uk/knowledge/technology/finishing/textile-finishing	
9	Textilefashionstudy.com/finishing-of-textiles-definitions-objective	
10	www.fibre2fashion.com/industry-article/1240/antimicrobial-finishes	

XIV COURSE CURRICULUM DEVELOPMENT COMMITTEE

S. No.	Name	Institute	Contact No.	Email
1	Shri. Bhagwan R Khade Lecturer	Sasmira, Mumbai	9930602109	bhagwankhade@sasmira.edu.in

