Maharashtra State Board of Technical Education, Mumbai

Teaching And Examination Scheme For Post S.S.C. Diploma Courses

Program Name : Diploma in Textile Technology

Program Code : TC

Duration of Program : 6 Semesters **With Effect From Academic Year: 2017 - 18**

Semester : Second **Duration : 16 Weeks**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme												Grand Total
								Theory							Practical					
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total	
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1	Elements of Electrical & Electronics Engineering	EOE	22239	4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
2	Fundamentals of Mechanical Engineering	FME	22240	4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
3	Organic Chemistry	OCH	22241	4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
4	Physical Chemistry	PCH	22242	4	-	2	6	3	70	28	30*	00	100	40	25#	10	25	10	50	20	150
5	Basics of Textile Manufacturing	BOT	22243	4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
6	Business Communication Using Computers	BCC	22009	-	-	2	2	--	--	--	--	--	--	--	35@^	14	15~	06	50	20	50
7	Textile Design and Color	TDC	22018	1	-	2	3	--	--	--	--	--	--	--	25@	10	25~	10	50	20	50
			Total	**21**	**-**	**14**	**35**	--	**350**	--	**150**	--	**500**	--	**185**	--	**165**	--	**350**	--	**850**

Student Contact Hours Per Week: **35 Hrs.** Medium of Instruction: **English**

Theory and practical periods of 60 minutes each. Total Marks **: 850**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@ Internal Assessment, # External Assessment, *# On Line Examination, ^ Computer Based Assessment

* Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment (5 marks each for Physics and Chemistry) to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

~ For the courses having ONLY Practical Examination, the PA marks Practical Part - with 60% weightage and Micro-Project Part with 40% weightage

- **If Candidate not securing minimum marks for passing in the "PA" part of practical of any course of any semester then the candidate shall be declared as "Detained" for that semester.**

Program Name : **Diploma in Textile Engineering Program Group**
Program Code : **TX / TC**
Semester : **Second**
Course Title : **Elements of Electrical and Electronics Engineering (TC,TX)**
Course Code : **22239**

1. RATIONALE

Electrical and electronics appliances, equipment are the most essential inputs of any textile industry. Various textile machines and other services like air conditioning, ventilation, water supply, lighting, etc. are powered by electrical energy. Further, the diploma engineer must have knowledge of different types of motors, their working, billing of electrical energy and the safety measures while working in textile industry. Along with this, textile machine manufacturers have introduced many electronic devices, to indicate, measure and control various units of textile processes. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts and principles of electrical and electronic engineering in various engineering applications to solve broad based problems in textile industry and maintain textile processing plants.

2. COMPETENCY

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

- **Use basic principles of electrical and electronics engineering to maintain textile processing plants.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a. Estimate the energy consumption to solve energy bill problems.
b. Identify transformers and motors used in textile industry.
c. Use electrical meters and lamps in textile industry.
d. Select different types of electronic components and semiconductor devices for textile industry applications.
e. Use sensors and actuators in textile industries.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks is for micro-project assessment to facilitate attainment of COs and the remaining 20 marks for tests and assignments given by the teacher.

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment.*

5. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

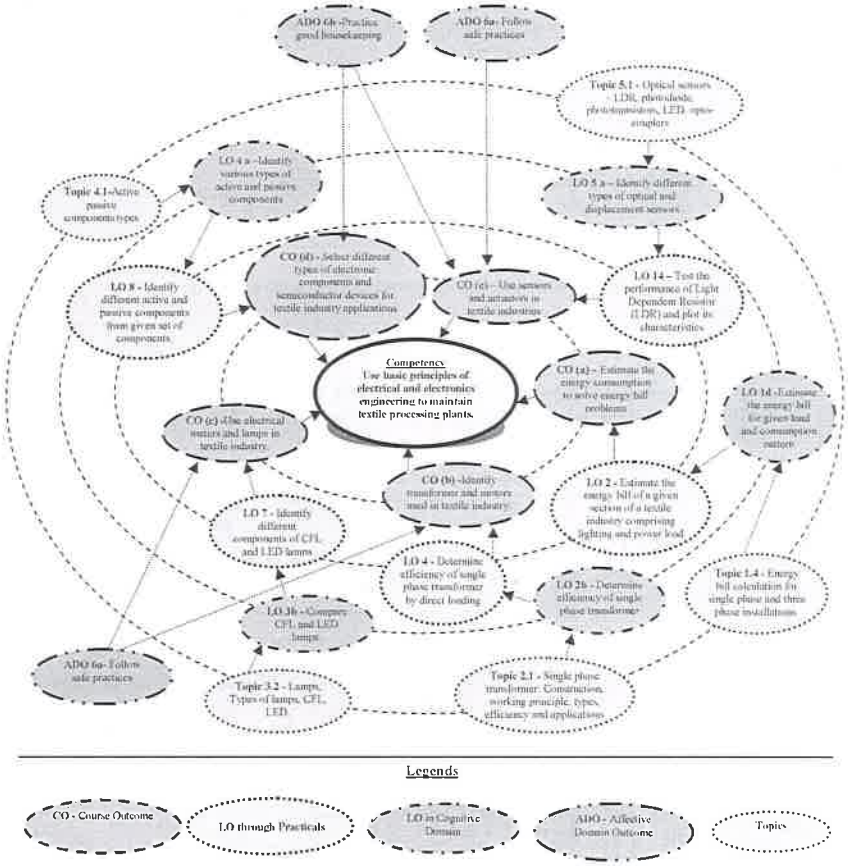

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e. sub-components of the COs) are to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
	Electrical		
1	Find currents and voltages in a given circuit using Kirchhoff's laws.	I	02
2	Estimate the energy bill of a given section of a textile industry comprising lighting and power load.	I	02
3	Determine power factor of given series Resistor-Inductor (R-L) circuit and Resistor-Capacitor (R-C) circuit.	I	02
4	Determine efficiency of single phase transformer by direct loading.	II	02
5	Determine efficiency of three phase induction motor by direct loading.	II	02
6	Prepare line diagram of three-phase wiring for a given section/department of a textile industry comprising of motors.	III	02
7	Identify different components of Compact Fluorescent Lamp (CFL) and Light Emitting Diode (LED) lamps.	III	02
	Electronics		
8	Identify different active and passive components from given set of components.	IV	02
9	Calculate values of resistors using color code chart and verify that using multimeter.	IV	02
10	Evaluate V-I characteristics of forward and reverse bias of diode.	IV	02
11	Verify input and output voltage waveforms of full wave rectifier.	IV	02
12	Measure temperature of water sample using Resistance Temperature Detector (RTD).	V	02
13	Measure the temperature of a given liquid using thermistor.	V	02
14	Test the performance of Light Dependent Resistor (LDR) and plot its characteristics.	V	02
15	Measure displacement using Linear Variable Differential Transducer/ Transformer (LVDT).	V	02
	Total		**30**

Note:

i. Given in above table is suggestive list of practical exercises. Teachers can design other similar exercises.

ii. To attain the Cos and competency, above listed Learning Outcomes (LOs) need to be undertaken the 'Applying Level' of Bloom's 'Cognitive Domain Taxonomy'.

Assessment of the 'Process' and 'Product' related skills in the laboratory/workshop/field work should be done as per suggested sample below:

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Safety measures	10
4	Observations and Recording	10
5	Interpretation of result and Conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10

Total	**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools and equipment.
e. Follow ethical Practices.

The development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTSREQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. No.
1	Dimmerstat 1 kVA,0-260 Volt AC	1,2
2	Resistance -290 ohm, 100 ohm	1,2
3	Digital multimeter : 3 1/2 digit display, 9999 counts digital multimeter measures: V_{ac}, V_{dc} (1000V max) , A_{dc}, A_{ac}(10 amp max) , (0 – 200 Hz) , resistance (0 - 100 MΩ) , capacitance and temperature	1,2,4,6, 8,9,10
4	Wattmeter 1A - 1 no., wattmeter 5A - 2 Nos.	2,4,5
5	Three phase induction motor, 3 HP, 440V AC	5
6	Single phase transformer 1 kVA, 0-260V AC	4
7	Ammeter 0-3-10-30 A AC/DC	1,2,4
8	Voltmeter 0-150-300V AC/DC	1,2,4
9	Different types of LED and CFL lamp	7
10	Tachometer for speed measurement 0-3000 rpm	4
11	Resisters, capacitors, inductors, diodes, transistors of different values/ types	8,9
12	Diode characteristics kit, milliammeter 0-5-10-50 milliamp, micro ammeter, 0-50-500-1000 micro-amp, 32 V d. c. power supply, and connecting cords	10
13	Full wave rectifier kit, CRO, probe, connecting cords	11
14	RTD experiment kit, RTD pt-100	12
15	Thermistor experiment kit, connecting cords	13
16	LDR experiment kit, connecting cords	14
17	LVDT experiment kit, connecting cords	15

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop LOs in cognitive domain for achieving the COs to attain the identified competency.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	Electrical	
Unit – I Fundamentals of Electrical Circuits	1a. Explain electrical quantities and their units. 1b. Inter-relate different electro-magnetic laws. 1c. Determine power factor in a given series R-L and Series R-C circuit. 1d. Estimate the energy bill for given load and consumption pattern.	1.1 Current, voltage, emf, power, energy, and its unit 1.2 Kirchhoff's laws: voltage and current, electromagnetic induction, Lenz law, Fleming's Right Hand/ Left Hand Rules 1.3 Series R-L, R-C circuits and their phasor diagram, types of power, power factor and their improvement method by capacitor 1.4 Energy bill calculation for single phase and three phase installations
Unit– II Electrical Machines	2a. Describe the construction of single phase transformer. 2b. Determine efficiency of single phase transformer. 2c. Describe the construction of servomotor and their applications. 2d. Describe single and three phase induction motors, and their applications. 2e. Determine efficiency of three phase Induction motor 2f. Select electrical machine for given applications.	2.1 Single phase transformer: construction, working principle, types, efficiency and applications 2.2 Servomotor: construction, working principle, application, types - single phase and three phase 2.3 Induction motors: construction, working principle, types, efficiency and applications 2.4 Electrical machine for textile industry
Unit– III Electrical meters and lighting system.	3a. Use various types of meters for given applications. 3b. Compare CFL and LED lamps based on construction and use. 3c. Describe methods of energy saving. 3d. Explain solar energy system.	3.1 Analog and digital meters for measuring AC/DC electrical quantities 3.2 Lamps- types, CFL, LED 3.3 Line diagram of 3 phase wiring circuit 3.4 Methods of energy saving in textile industry 3.5 Solar energy application in textile industry
	Electronics	
Unit-IV Electronic components and Semiconductor Devices	4a. Identify various types of active and passive components. 4b. Classify passive components 4c. Classify materials. 4d. Compare the given semiconductors. 4e. Explain working principle of P-N junction diode. 4f. Explain working principle of half wave and full wave rectifier. 4g. Explain the working principle of transistor as switch.	4.1 Active and passive components 4.2 Resistors-types of resistors, colour coding 4.3 Capacitor and inductor – symbol, properties and classification 4.4 Classification of material - conductors, semiconductors and insulators 4.5 Semiconductor – intrinsic, extrinsic, P and N type 4.6 P-N junction diode – unbiased, forward and reverse bias, V- I characteristics of diode, application 4.7 Half wave and full wave rectifiers-working principle 4.8 Transistor – construction, types – PNP and NPN, working, operating regions – active, cut-off, saturation 4.9 Application of amplifier, transistor as switch
Unit-V Sensors and Actuators	5a. Identify different types of optical and displacement sensors. 5b. Identify force and weight measurement sensors. 5c. Identify different types of temperature and pressure sensors. 5d. Identify different types of actuators. 5e. Use suitable sensors and actuators for given situation. 5f. Explain the working of LVDT. 5g. Explain steps to measure the temperature of given liquid using thermocouple.	5.1 Optical sensors – LDR, photo diode, phototransistor, LED, opto-couplers 5.2 Displacement sensors – LVDT, capacitive sensor 5.3 Force and weight measurement – strain gauge, humidity sensors 5.4 Temperature sensors – RTD, thermistor, thermocouples 5.5 Pressure sensors – bourdon tubes, bellows 5.6 Actuators – relays, contactors, solenoids, electric and pneumatic 5.7 Applications – blow room, card auto leveller, yarn evenness testing, sizing, and automatic weft straightening

Note: To attain the COs and competency, above listed Learning Outcomes(LOs) need to be undertaken to achive the ' Application Level 'of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Electrical					
I	Fundamentals of Electrical Circuits	10	02	03	05	10
II	Electrical Machines	12	02	05	07	14
III	Electrical meters and lighting system.	10	02	03	05	10
	Electronics					
IV	Electronic Components and Semiconductor Devices	14	04	05	07	16
V	Sensors and Actuators	18	05	07	08	20
	Total	**64**	**15**	**23**	**32**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Prepare a table of type of electrical machines and relevant industrial application.
b. Prepare presentation showing different types of motors, transformers, and lamps used in textile industries.
c. Collect leaflets and specifications of different types of sensors, actuators used in textile industries.
d. Collect leaflets and specifications of different types of active and passive components used in textile industries.
e. Prepare question bank referring old MSBTE question papers.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses ***(MOOCs)*** may be usd to teach various topics/subtopics.
b. ***'L' in item No. 4*** does not mean 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/subtopics*** 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 LOs/COs through classroom presentations (see implement guideline for details).
d. In respect of item 10 above, teachers need to ensure to create opportunities and provisions for such ***co-curricular activities.***
e. Guide student(s) in undertaking micro-projects.
f. Assign unit wise tutorials to group of 4 to 5 students for solving problems unit wise.
g. Assign micro projects to group of 4 to 5 students and let them prepare and present the project through PPT. Group shall submit a report which is limited to 5 pages.
h. Use of video, animation films to explain concepts, facts and applications related to electrical and electronics engineering.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of practicals, cognitive domain and affective domain LOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than 16 (sixteen) student engagement hours during the course.

In the first two semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Energy bill:** Visit various textile industry/department and estimate their energy bills.
b. **3 phase circuit diagram:** Prepare a 3 phase circuit diagram incorporating machines and lighting loads, on banner/chart for a textile industry and estimate energy consumption per day.
c. **Electrical transformer:** Visit textile industry/department, collect information and prepare presentation incorporating the specifications of transformers used in textiles industry.
d. **Electrical servomotors:** Visit textile industry/department, collect information and prepare presentation on specifications and rating of servomotors used in various textiles industry.
e. **Electrical induction motors:** Visit textile industry/department and collect information and prepare presentation on specifications and rating of Induction motors used in various textiles industry.
f. **Electrical lamps:** Visit textile industry/department and collect information and prepare presentation on specifications and rating of different types of lamps used in various textiles industry.
g. **Solar energy:** Collect technical specifications for different solar panels used in textile industry and prepare a chart/ presentation.
h. **Resistor color codes:** Prepare resistor color code charts. Use the chart to calculate values of different resistors. Collect information of variable resistors, rheostats used in laboratory.
i. **Semiconductor devices**: Prepare presentation on active/passive components, semiconductor devices used in different textile units viz. spinning, weaving, sizing, dying, and testing. Collect different active semiconductor devices, list their applications and specifications.
j. **Transducers:** Prepare presentation incorporating animation displaying different transducers used in textile industry.
k. **Sensors:** Prepare presentation incorporating detailed specifications of temperature sensors, pressure sensors, optical sensors, strain gauges used in different processing machines.
l. **Actuators:** Prepare presentation incorporating detailed information of actuators – relays, contactors, solenoids, electric and pneumatic used in different processing units.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Electrical Engineering Fundamentals	Del, Toro Vincent	Prentice Hall, India, 2015 ISBN: 9789332551763
2	Basic Electrical Engineering	Kothari, D.P.	McGraw-Hill Education, India, 2009 ISBN: 9780070146112
3	A text-book of electrical engineering	Rajput, R.K.	Laxmi Publications, New Delhi, 2009 ISBN: 9789380386348
4	Electric Machinery Fundamentals	Chapman,	McGraw-Hill Education, USA,

S. No.	Title of Book	Author	Publication
		Stephen J.	2010 ISBN: 97800710705222010
5	Electrical Machinery	Bimbhra, P.S.	Khanna Publishers, New Delhi, 2014 ISBN: 9788174091734
6	Basic Electrical Engineering	Bakshi, U.A. Bakshi, V.U.	Technical Publications, New Delhi, 2008 ISBN: 9788184314885
7	Principles of electronics	Mehta, V.K., Mehta, Rohit	S. Chand New Delhi, 2005 ISBN: 9788121924504
8	Basic Electronics (solid state)	Theraja, B. L.	S. Chand New Delhi, 2006 ISBN: 9788121925556
9	Electronics and Electrical Measurements and Instrumentation	Sawhaney, A. K.	Dhanpat Rai & Co. New Delhi, 2014 ISBN: 9788177001006
10	A Course in Electronics and Electrical Measurements and Instrumentation	Gupta, J. B.	S K Kataria and Sons, India, 2013 ISBN: 9788188458936
11	Sensors and Actuators: Control System Instrumentation	De Silva, Clarence W.	CRC Press; Taylor & Francis, Boco Roton, 2007 ISBN: 9781420044836
12	Electronic controls in Textile Machines	Joshi, Hiren; Joshi, Gauri.	NCUTE training program, New Delhi, 2003

14. SOFTWARE/LEARNING WEBSITES

a. https://en.wikipedia.org/wiki/E-textiles
b. http://eartheasy.com/live_energyeff_lighting.htm
c. http://www.sengpielaudio.com/calculator-ohm.htm
d. http://freevideolectures.com/Course/2335/Basic-Electrical-Technology
e. http://www.electrical4u.com/electric-lamp-types-of-electric-lamp/
f. http://www.electrical4u.com/induction-motor-types-of-induction-motor/
g. http://www.electricaltechnology.org/2012/03/lets-try-to-understand-calculation-of.html
h. https://www.circuitspecialists.com/blog/differences-between-analog-and-digital-panel-meters/
i. http://www.electronicsandyou.com/blog/active-and-passive-electronic-components.html
j. https://www.ethz.ch/flexible-electronics
k. https://learn.sparkfun.com/tutorials/transistors
l. www.ee.buffalo.edu/faculty/paololiu/566/sensors.ppt
m. http://www.zapmeta.com.my/src?q=electronic+sensors&sc=s
n. www.zapmeta.co.in/Electronic+sensors
o. http://www.electronics-tutorials.ws/io/io_3.html
p. http://www.engineersgarage.com/articles/pressure-sensors-types-working
q. https://ielm.ust.hk/dfaculty/ajay/courses/alp/ieem110/lecs/actuators/actuators.html

15. PO-COMPETENCY-CO MAPPING

Semester II Competency and COs	PO 1 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO 1 Textile Processing	PSO 2 Maintenance and quality control
	Programme Outcomes Elements of Electrical & Electronics Engineering (Course Code: .....) Mark '3' for high, '2' for medium, '1' for low in correlation for competency, CO, PO, PSO or '0' for no correlation											
Competency: Use basic principles of electrical and electronics engineering to maintain textile processing plants	3	1	2	1	1	1	1	1	1	2	1	1
a. Estimate the energy consumption to solve energy bill problems	3	1	2	1	1	0	2	1	1	2	1	1
b. Identify transformer and motors used in textile industry	3	1	2	1	1	0	1	1	1	2	1	1
c. Use electrical meters and lamps in textile industry	3	1	2	1	1	0	1	1	1	2	1	1
d. Select different types of electronic components and semiconductor devices for textile industry applications	3	2	2	1	1	1	1	1	1	2	1	1
e. Use sensors and actuators in textile industries	3	2	2	1	1	1	1	1	1	2	1	1

Program Name : **Diploma in Textile Engineering Program Group**
Program Code : **TX / TC**
Semester : **Second**
Course Title : **Fundamentals of Mechanical Engineering (TC,TX)**
Course Code : **22240**

1. RATIONALE

Textile industry uses mechanical equipment and machines, like transmission systems steam boilers, air compressors, fluid pumps, material handling equipment, etc. for its working and in various processes. The prime responsibility of a textile technician working on the shop floor is to ensure smooth and continuous functioning of all the machines and equipment for quality production. This requires him to operate and maintain the textile equipment and machines, which have mechanical systems, like gears, shafts, bearings, couplings, etc. Such abilities and competencies can only be developed with the use of basic knowledge of force, work, energy, materials used for making the machines, principles of motion, their transformation, and the methods of maintenance. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts and principles of mechanical engineering in various textile production plants to solve broad based problems.

2. COMPETENCY

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

- **Use basic principles of mechanical engineering to maintain textile manufacturing plants.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a. Apply principles of force, work, and energy to textile machines.
b. Apply principles of kinetics and kinematics for textile machine applications.
c. Identify different mechanisms in textile machines.
d. Estimate the values of mechanical properties of materials.
e. Use appropriate lubricants in textile machines.
f. Select relevant transmission drives for textile machines.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks is for micro-project assessment to facilitate attainment of COs and the remaining 20 marks for tests and assignments given by the teacher.

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *- Practical;* ***C*** *– Credit,* ***ESE*** *- End Semester Examination;* ***PA*** *- Progressive Assessment.*

5. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

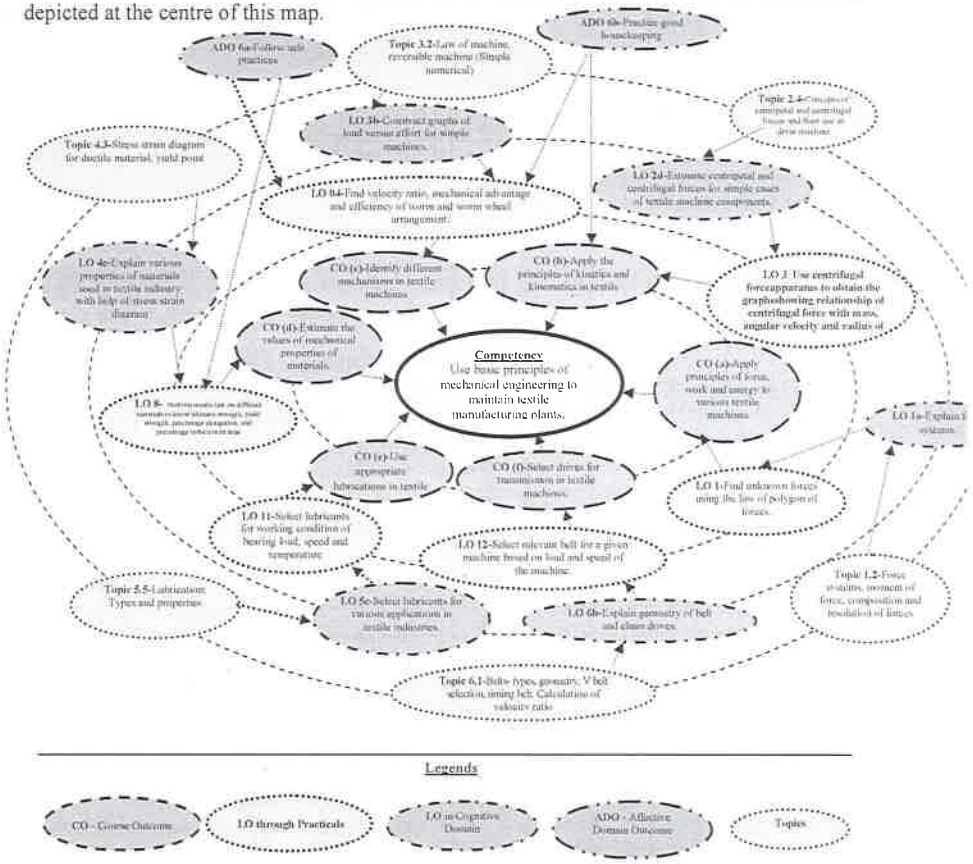

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e. sub-components of the COs) are to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
1	Use the Universal Force Table to find out resultant of forces.	I	02
2	Use moment of force apparatus to verify law of moments.	I	02
3	Use centrifugal force apparatus to obtain the graphs showing relationship of centrifugal force with mass, angular velocity and radius of rotation.	II	03
4	Use worm and worm wheel arrangement to find velocity ratio, mechanical advantage, and efficiency.	III	02
5	Use table mounted single purchase crab and double purchase crab to find velocity ratio, mechanical advantage, and efficiency.	III	03
6	Use '2D-working model software'/similar software and related mechanism to calculate displacement, velocities and acceleration of different links.	III	04
7	Use relevant arrangement to determine strain and stress in the given spring.	IV	02
8	Use UTM to conduct tensile test on different materials to determine the ultimate strength, yield strength, percentage elongation, and percentage reduction in area.	IV	04
9	**Use tensile testing machine to obtain the graph of stress versus strain of given textile material .**	IV	02
10	Use different combinations of surfaces of metal, wood, glass to determine coefficient of friction among them.	V	02
11	Use relevant **charts** to select lubricants for working condition of bearing load, speed, and temperature.	V	02
12	Use relevant **charts** to select relevant V belt for a given machine based on load and speed of the machine.	VI	02
13	Use relevant **charts** to select relevant chain for a given machine based on load and speed of the machine	VI	02
	Total		**32**

Note:

i. Given in above tables is suggestive list of practical exercises. Teachers can design other similar exercises.

ii. To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Applying Level' of Bloom's 'Cognitive Domain Taxonomy'. Assessment of the 'Process' and 'Product' related skills in the laboratory/workshop/field work should be done as per suggested sample below:

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Safety measures	10
4	Observations and Recording	10
5	Interpretation of result and Conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10
	Total	**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools and equipment.
e. Follow ethical Practices.

The development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. No.
1	Universal Force Table (Consists of a circular 40 cm dia. Aluminum disc, graduated into 360 degrees.) with all accessories.	1, 2
2	Five Steel plates of unknown weight.	1, 2
3	Weights 50gm, 100gm, 200gm, 500gm, 1000gm (three pieces of each).	1, 2, 4,5,7
4	**Centrifugal force apparatus.**	**3**
5	Differential axle and wheel (wall mounted unit with the wheel of 40 cm diameter and axles are insteps of 20 cm and 10 cm reducing diameter.	4, 5,
6	Worm and worm wheel (wall mounted unit with threaded spindle, load drum, effort wheel; With necessary slotted weights, hanger and thread).	4
7	Simple screw Jack (Table mounted metallic body , screw with a pitch of 5 mm carrying a double flanged turn table of 20 cm diameter.	4, 5
8	Single Purchase Crab winch (Table mounted heavy cast iron body. The effort wheel is of C.I. material of 25 cm diameter mounted on a shaft of about 40mm dia. On the same shaft a geared wheel of 15 cm diameter.	5
9	Double Purchase Crab winch (Having assembly same as above but with double set of gearing arrangement)	5
10	Wooden or Acrylic working models of various popular mechanisms	4, 5, 6
11	Latest licensed networking version of '2D-working model software'/similar planar mechanism simulation software.	4, 5, 6
12	1 meter and half meter steel rules.	1 to 9
13	Helical springs (Close and open coil) of different sizes and stand.	7
14	Universal Testing Machine 5 Ton capacity.	8
15	Friction apparatus for motion along horizontal and inclined plane (base to	

S. No.	Equipment Name with Broad Specifications	Exp. No.
	which a sector with graduated arc and vertical scale is provided. The plane may be clamped at any angle up to 45 degrees pan. Two weight boxes (each of 5 gm. 10 gm. 2-20 gm. 2-50 gm. 2-100 gm. weight).	10, 11
16	Mass hanger and pointer for friction apparatus.	7, 8, 9
17	Glass strip, Wooden surface, Metallic surface for friction apparatus.	10, 2
18	Working model of different drives such as gear drive, belt drive, etc.	12, 13
19	Actual belts, chains, gears and bearings commonly used in textile industries.	12, 13
20	**Tensile tester capacity up to 500kg ,speed up to 100mm/min.**	**9**
21	**Lubricant selection charts**	**11**
22	**Industrial belt selection charts**	**12**
23	**Rating charts for chain**	**13**
24	**Moment of force apparatus**	**2**

Note: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop LOs in cognitive domain for achieving the COs to attain the identified competency.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Force, Work and Energy,	1a. Explain force systems. 1b. Construct polygon of forces. 1c. Apply principles of work in various textile machines. 1d. Identify various application of potential energy and kinetic energy in textile machines.	1.1 Force, principle of transmissibility of force 1.2 Force systems, moment of force, composition and resolution of forces 1.3 Equilibrium and resultant of forces 1.4 Work –definition, work of force, work of couple moment 1.5 Energy-potential energy, gravitational potential energy, elastic potential energy, kinetic energy ~~1.6 Work –energy theorem~~
Unit– II Kinetics and Kinematics	2a. Evaluate weight of given substance related to textile industry from its mass. 2b. Differentiate between linear and angular motion. 2c. Calculate linear and angular velocities and accelerations for simple cases of textile machine components. 2d. Estimate centripetal and centrifugal forces for simple cases of textile machine components	2.1. Kinetics – Mass, weight, inertia, momentum, impulse 2.2. Newton's laws of motion 2.3. Kinematics – linear & angular motion 2.4. Concepts of centripetal and centrifugal forces and their use in dryer machine

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– III Machines and Mechanisms	3a. Determine efficiency of simple machines. 3b. Construct graphs of load versus effort for simple machines. 3c. Develop simple mechanisms for textile processes using software. 3d. Calculate velocity and acceleration of simple mechanisms for textile processes using planar mechanism simulation software.	3.1 Machines - definition, mechanical advantage, velocity ratio, efficiency (simple numerical) 3.2 Law of machine, reversible machine (simple numerical) 3.3 Simple machines: wheel and axle, simple screw jack, worm & worm wheel, single and double purchase crab 3.4 Planar Mechanisms- slider crank mechanism and four bar chain mechanism 3.5 Inversions of mechanism 3.6 Use of simulation software
Unit-IV Mechanical properties of materials.	4a. Identify stresses in various components of machines. 4b. Estimate stresses in various components of textile machines under simple loading. 4c. Explain various properties of materials used in textile industry with help of stress strain diagram. 4d. Calculate factor of safety in given situation through simple numerical. 4e. Classify different materials as Isotropic, homogeneous and orthotropic material.	4.1 Simple stresses & strains – stress, strain, types of stresses, (simple numerical) 4.2 Hooke's law, elastic limit, Modulus of elasticity, modulus of rigidity, ultimate stress, working stress (simple numerical), tenacity 4.3 Stress strain diagram for ductile material, yield point 4.4 Factor of safety (simple numerical) 4.5 Material: Isotropic, homogeneous, and orthotropic material, their applications
Unit –V Friction and lubrication.	5a. Evaluate coefficient of friction. 5b. Select bearings for various applications in textile industries. 5c. Select lubricants for various applications in textile industries.	5.1 Concept of friction, types of friction, factors affecting friction, coefficient of friction (simple numerical) 5.2 Types of bearings: journal bearing, ball bearing and roller bearing, uses of bearings in textile industry 5.3 Bearing specifications and system of code and description 5.4 Selection of bearings, criteria of selection 5.5 Lubrication: Types and properties
Unit-VI Transmission	6a. Select the proper drives for different applications in textile industries. 6b. Explain geometry of belt and chain drives.	6.1 Belts- types, geometry, V belt, selection, timing belt. Calculation of velocity ratio 6.2 Chains: Types, geometry, roller chain sprocket, Velocity ratio

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	6c. Explain type and terminologies gears. 6d. Compare different gear trains. 6e. Calculate velocity ratio in all above cases.	6.3 Cams: types of cams, types of followers, follower positions, follower shape and motion 6.4 Gears: types and applications 6.5 Spur gear terminologies, involute tooth profile 6.6 Gear in mesh: Interference, undercutting, backlash, calculation of velocity ratio 6.7 Gear trains: simple, compound, reverted, and epicyclic

Note: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Force ,Work and Energy	08	02	02	02	06
II	Kinetics and Kinematics	08	02	04	04	10
III	Machines and Mechanisms	08	02	04	06	12
IV	Mechanical properties of materials	13	04	04	08	16
V	Friction and lubrication	13	03	04	06	13
VI	Transmission	14	03	04	06	13
Total		**64**	**16**	**22**	**32**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

9. 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

a. Undertake survey of lubricants used in textile machineries.
b. Give seminar on any relevant topic.
c. Library survey regarding engineering material used in textile machineries.
d. Prepare power point presentation or animation for showing different types of transmission drives used in textile machines.
e. Undertake a survey of different machines and mechanisms used in textile plant.
f. Prepare question bank referring old MSBTE question papers.

10. 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 LOs/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. Assign micro projects to group of 4 to 5 students and let them prepare and present the project through PPT. Group shall submit a report which is limited to 5 pages.
g. Demonstrate estimation of kinematic data of various mechanisms used in Textile industry through 2D Working Model/similar software.
h. Use of video, animation films to explain concepts, facts and applications related to construction and working of different transmission drives.
i. Use real components to teach the concepts related to belts, chains, bearings, gears, V-pulley, timers, pulleys and others.

11. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of practicals, cognitive domain and affective domain LOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than 16 (sixteen) student engagement hours during the course.

In the first two semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Energy:** Enlist the applications of centrifugal and centripetal forces in various spinning and weaving machines.
b. **Mass and Weight:** Calculate mass and weight of fine yarn, medium yarn and coarser yarn of same length and different material.
c. **Machines:** Prepare graphs of load versus effort to demonstrate efficiency of textile machines.
d. **Mechanisms:** Prepare models for combination of different linkages to form different mechanisms.
e. **Materials**: Prepare chart indicating mechanical properties of different materials used in textile plant.
f. **Bearings**: Collect bearings according to the specifications and their uses in textile machines.

g. **Lubricants**: Prepare charts indicating lubricant, specification and their use in textile plant.
h. **Belts**: Select relevant belt for different textile machines using industrial v belt chart.
i. **Gears:** Prepare chart displaying specification and use of different gears.
j. **Gear trains:** Prepare model of gear train useful for textile plant machines.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Textile mechanics volume I	Slatar, K.	The textile institute , Manchester, 1977, ISBN 10: 0900739274
2.	Machine and Mechanisms	Myszka, David H.	Pearson education, New York., 2011, ISBN 13: 978-0-13-215780-3
3.	Theory of machines and Mechanisms.	Shigley, Joseph E. Uicker, J.J.Jr. Pennock,G.R.	Oxford University Press, New York, 2011, ISBN 13: 9780195371239
4.	Theory of machines and Mechanisms.	Rattan, S.S.	Tata McGraw-Hill Education, New Delhi,2009 ISBN 13: 9780070144774
5.	Strength of Materials: Elementary theory and problems	Timoshenko, S.	CBS Publishers, New Delhi 2004,ISBN 13:9788123910307
6.	Strength of Materials	Rajput, R.K.	S. Chand Limited, 2006 ISBN 13: 9788121925945
7.	Engineering Mechanics	Bhavikatti,S.S. Rajashekharappa,K.G.	New Age International, New Delhi,2015,ISBN 13:9788122437980
8.	A Text Book of Applied Mechanics	Rajput,R.K.	Laxmi Publications,New Delhi,1988, ISBN 13:9788170082088
9.	Engineering Mechanics Statics and dynamics	Shames,I.H.	Pearson Education India, 2005 ISBN 13: 9788177581232

13. SOFTWARE/LEARNING WEBSITES

a. http://www.physicsclassroom.com/mmedia/kinema
b. http://fearofphysics.com/Friction/frintro.html
c. www.sciencejoywagon.com/physicszone
d. www.science.howstuffworks.com
e. https://phet.colorado.edu/en/simulation/forces-and-motion-basics
f. https://phet.colorado.edu/en/simulation/friction
g. http://www.nptel.ac.in/courses/112102015/22
h. http://hperphysics.phy-astr.gsu.edu/hbase/hph.html
i. http://www.mechanicalhero.com/2011/12/mechanical-drives.html
j. http://physics.stackexchange.com/questions/27897/difference-b-w-kinetics-kinematics-w-concrete-example

k. http://www.mecheng.iisc.ernet.in/~bobji/funtri/assign/Lubricants.htm
l. http://onlinelibrary.wiley.com/subject/code/000080
m. http://nptel.ac.in/courses/116102012/

14. PO-COMPETENCY-CO MAPPING

Semester II Competency and COs	Programme Outcomes PO 1 Basic knowledge	PO 2 Discipline knowledge	PO 3 Experiments and practice	PO 4 Engineering Tools	PO 5 The engineer and society	PO 6 Environment and sustainability	PO 7 Ethics	PO 8 Individual and team work:	PO 9 Communication	PO 10 Life-long learning	PSO 1 Textile Processing	PSO 2 Maintenance and quality control
	Fundamentals of Mechanical Engineering (Textile Group Specific) (Course Code: .....) Mark '3' for high, '2' for medium, '1' for low in correlation for competency CO,PO,PSO or '0' for no correlation											
Competency: Use basic principles of mechanical engineering to maintain textile manufacturing plants	3	1	2	3	1	1	1	2	2	3	3	3
a. Apply principles of force, work and energy to various textile machines	3	1	2	1	2	1	1	2	2	3	2	1
b. Apply principles of kinetics and kinematics in textile machines	3	2	3	2	1	1	1	2	2	2	3	2
c. Identify different mechanisms in textile machines	3	2	3	2	2	1	1	2	2	2	3	2
d. Estimate the values of mechanical properties of materials	2	2	3	1	2	2	2	2	2	2	3	2
e. Use appropriate lubricants in textile machines	3	1	2	1	1	2	2	1	1	2	2	3
f. Select drives for transmission in textile machines	3	2	3	3	2	1	1	2	1	3	2	3

Program Name : **Diploma in Textile Technology**

Program Code : **TC**

Semester : **Second**

Course Title : **Organic Chemistry**

Course Code : **22241**

1. RATIONALE

In textile industries, during wet processing of textiles various chemicals are used. The knowledge of physical and chemical properties of these chemicals helps the diploma engineers to control different textile processes effectively. Organic chemistry deals with study of physical and chemical properties of organic compounds, and their applications. Some textile auxiliaries and fibres like cotton, silk, wool and polyester are organic in nature. Therefore, knowledge of organic chemistry is essential for understanding textile processes like scouring, bleaching, dyeing, printing, and finishing. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts of organic chemistry to solve broad problems in textile wet processing.

2. COMPETENCY

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

- **Use organic compounds in textile wet processing.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a. Select relevant organic compound for manufacturing textile auxiliaries.
b. Choose relevant hydrocarbon for textile processing.
c. Select relevant alcohols in pretreatment and dyeing.
d. Select aldehydes and ketones used in finishing of textiles.
e. Choose relevant carboxylic acid for textile wet processing.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
L	T	P			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.
Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *- Practical;* ***C*** *– Credit,* ***ESE*** *- End Semester Examination;* ***PA*** *- Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

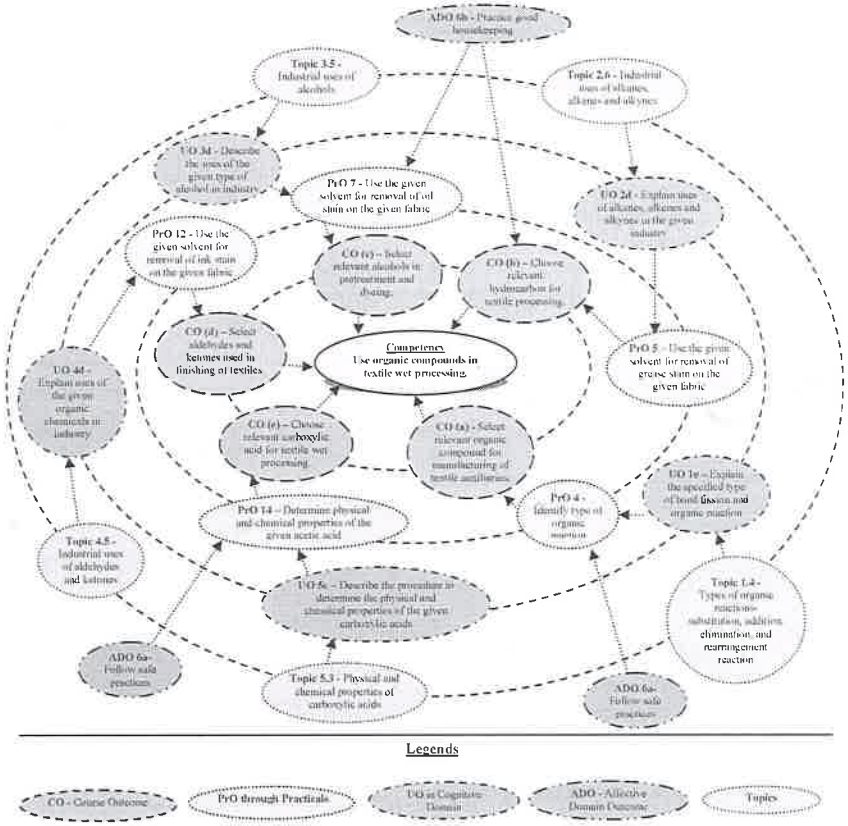

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Use given organic compound to detect its acidic/ basic/ phenolic/ neutral nature.	I	02
2	Use Lassaigne's test to detect Nitrogen/ Halogens/ Sulphur in the given organic compound.	I	02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
3	Detect functional group of the given organic compound.	I	02
4	Identify type of organic reaction.	I	02
5	Use the given solvent for removal of grease stain on the given fabric.	II	02*
6	Identify given alcohol by qualitative analysis.	III	02*
7	Use the given solvent for removal of oil stain on the given fabric.	III	02
8	Determine boiling point of given organic compound.	IV	02*
9	Identify given aldehyde by qualitative analysis	IV	02
10	Identify given ketone by qualitative analysis	IV	02
11	Prepare urea-formaldehyde resin and determine its physical properties.	IV	02
12	Use the given solvent for removal of ink stain on the given fabric.	IV	02
13	Identify given carboxylic acid by qualitative analysis.	V	02*
14	Determine physical and chemical properties of the given acetic acid.	V	02
	Total		**28**

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Selection of suitable component, apparatus/instrument	20
2	Preparation of experimental set up	10
3	Setting and operation	10
4	Safety measures	10
5	Observations and Recording	10
6	Interpretation of result and Conclusion	20
7	Answer to sample questions	10
8	Submission of report in time	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools, equipment, apparatus, and glassware.
e. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. No.
1.	Borosilicate test tubes (diameter-13 mm, length-100 mm), beakers (150 ml, 250 ml), glass rod made up of soda glass, test tube holder, test tube stand	1, 2, 3, 4, 6
2.	Thiele's tube (length-150 mm, diameter-25 mm), thermometer (0^0C to 360^0C), capillary	4
3.	Porcelain evaporating dish (diameter-60 mm, capacity-20 ml)	3, 5
4.	Sodium fusion tube (diameter-8 mm, length-50 mm)	2, 4, 5
5.	Bunsen burner (diameter-11 mm, height-125 mm, gas inlet-8 mm), tripod stand, wire gauze	2, 3, 4, 5, 7
6.	Burette stand, clamp	4, 7
7.	Simple funnel (rim-120 mm, stem length-120 mm), filter paper, suction pump, porcelain Buchner filter funnel (inside diameter-14.5 mm, perforated area diameter-11 mm, depth-8.5 mm)	2, 5, 6
8.	Quickfit distillation assembly: round bottom flask (200 ml), splash head, double surface condenser (200 mm), receiver adapter, thermometer	7
9.	Spotting brush	8, 9, 10

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UCs for achieving the COs to attain the identified competency.

Unit	Unit Outcomes (UOs) (In cognitive domain)	Topics and Sub-topics
Unit – I Organic compound reactions and mechanism	1a. Explain characteristics of the specified organic compound. 1b. Describe the procedure to identify the specified organic compounds by their functional groups. 1c. Describe the procedure to identify the given organic compound based on the structure. 1d. Describe the properties of the given type of organic	1.1 Organic compounds – definition and general characteristics, Structure and functional group, identification procedure. 1.2 Types of organic compounds: homologous series. 1.3 Bond fission – Homolytic and Heterolytic bond fission. 1.4 Types of organic reactions – substitution, addition, elimination, and rearrangement reaction.

Unit	Unit Outcomes (UOs) (In cognitive domain)	Topics and Sub-topics
	compound. 1e. Explain the specified type of bond fission and organic reaction 1f. Distinguish the properties of the given two reaction mechanisms. 1g. Describe the procedure to select relevant organic compound to manufacture the given textile.	1.5 SN1 and SN2 reaction mechanism – definition, reaction, mechanism and energy profile diagram.
Unit – II Aliphatic hydrocarbons	2a. Identify the specified Aliphatic Hydrocarbons based on their nomenclature, classification and electronic structure. 2b. Select reagents for preparation of the given Aliphatic Hydrocarbons with justification. 2c. Compare the physical and chemical properties of the specified alkanes, alkenes, and alkynes. 2d. Explain uses of alkanes, alkenes and alkynes in the specified industry. 2e. Select relevant hydrocarbon for the given textile processing with justification.	2.1 Aliphatic hydrocarbons. 2.2 Alkanes preparation methods: From anhydrous sodium salts of carboxylic acids, Kolbe electrolytic method, and reduction of alkyl halides, Wurtz synthesis, and catalytic hydrogenation of unsaturated hydrocarbons. 2.3 Alkenes preparation methods: dehydration of alcohols, dehydrohalogenation of alkyl halides, thermal and catalytic cracking. 2.4 Alkynes preparation methods: de-hydrohalogenation, action of water on calcium carbide. 2.5 Physical and chemical properties of alkanes, alkenes, and alkynes. 2.6 Industrial uses of alkanes, alkenes and alkynes.
Unit-III Aliphatic Hydroxyl Compounds	3a. Identify the given type of alcohol, based on nomenclature, classification and electronic structure with justification. 3b. Describe the method of preparation of the given type of alcohol. 3c. Compare physical and chemical properties of the given type of alcohol. 3d. Describe the uses of the given type of alcohol in industry. 3e. Select relevant alcohol for the given pretreatment and dyeing process with justification.	3.1 Alcohols. 3.2 Ethanol preparation methods: From ethylene, direct hydration of ethylene with steam under pressure, reduction of acetaldehyde. 3.3 Physical and chemical properties and uses of ethanol, definition of absolute alcohol, methylated spirit, power alcohol and ethyl alcohol. 3.4 Preparation, physical and chemical properties of glycol and glycerol. 3.5 Industrial uses of alcohols.
Unit -IV	4a. Identify the specified	4.1 Aldehydes and Ketones.

Unit	Unit Outcomes (UOs) (In cognitive domain)	Topics and Sub-topics
Aldehydes and ketones	Aldehydes and Ketones based on their nomenclature, classification and electronic structure with justification. 4b. Choose reagents for preparation of Aldehydes and Ketones with justification. 4c. Compare physical and chemical properties of the given Aldehydes and Ketones. 4d. Explain the uses of the given organic chemicals in industry. 4e. Describe the procedure to select aldehydes and ketones used in finishing of the given textile.	4.2 Aldehydes preparation methods: from alcohol, using mixture of methane and oxygen, by heating calcium formate, from unsymmetrical dihalogen compounds, from acetylenes and Rosenmund's reduction. 4.3 Acetone preparation methods: from isopropyl alcohol, calcium acetate, acetic acid, and acetylene. 4.4 Physical and chemical properties of Aldehydes and Ketones: addition of cyanide and hydroxyl amine, reduction, oxidation, reaction with Fehling's solution, Tollen's reagent. 4.5 Industrial uses of Aldehydes and Ketones.
Unit -V Carboxylic acids	5a. Identify carboxylic acids based on nomenclature, classification, and electronic structure with justification. 5b. Describe the method of preparation of the specified carboxylic acids. 5c. Describe the procedure to determine the physical and chemical properties of the given carboxylic acids. 5d. Describe the procedure to choose the relevant carboxylic acid for the given textile wet processing.	5.1 Carboxylic acids- definition, nomenclature, classification, and electronic structure. 5.2 Acetic acid preparation methods: quick vinegar process, hydrolysis of alkane nitrile, from Grignard reagent, decarboxylation of malonic acid and hydrolysis of ethyl acetate. 5.3 Physical and chemical properties of carboxylic acids: dehydration, esterification, reaction with PCl3, PCl5 and SOCl2, reaction with ammonia, reduction, decarboxylation and halogenation. 5.4 Industrial uses of carboxylic acids.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Organic compound reactions and mechanism	18	04	06	10	20
II	Aliphatic hydrocarbons	14	04	06	10	20
III	Aliphatic hydroxyl compounds	10	02	03	05	10

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
IV	Aldehydes and ketones	12	02	03	05	10
V	Carboxylic acids	10	02	03	05	10
Total		**64**	**14**	**21**	**35**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Market survey of different organic solvents and compare them based on their properties and applications.
b. Library survey regarding different hydrocarbons used in different industries.
c. Prepare a table of type of organic compounds and relevant industrial application.
d. Prepare question bank referring old MSBTE question papers.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the LOs/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. Assign unit wise assignments to group of 4 to 5 students for solving problems unit wise.
g. Assign micro projects to group of 4 to 5 students and let them prepare and present the project through PPT. Group shall submit a report which is limited to 5 pages.
h. Use of video, animation films to explain concepts, facts and applications related to Organic Chemistry.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course.

In the first ***four*** semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Organic Compounds:** Prepare presentation on classification of organic compounds.
b. **S_N1 and S_N2 reaction mechanism:** Prepare presentation on comparison of S_N1 and S_N2 reaction mechanism with potential energy diagram.
c. **Aliphatic hydrocarbons:** Prepare molecular models of alkanes, alkenes and alkynes to demonstrate the structure of different hydrocarbons.
d. **Alcohols:** Prepare presentation on the industrial manufacturing of ethyl alcohol.
e. **Industrial uses of organic compounds:** Prepare presentation on the uses of aliphatic hydrocarbons, alcohols, aldehydes, ketones and carboxylic acids along with their physical properties.
f. **Chemical properties of aldehydes and ketones:** Prepare a concept map of chemical properties of aldehydes and ketones for display in class.
g. **Functional group**: Collect different aliphatic organic compounds available in the laboratory, identify functional groups present in each compound by experimentation, and report the results in the presentation form.
h. **Industrial uses of alcohol, aldehydes, and ketones:** Collect raw stained samples from textile industry, remove stains selecting relevant organic solvent and report the results in the presentation form.
i. **Physical and chemical properties of carboxylic acids:** Collect the information about carboxylic acids used for textile wet processing and report it in the presentation form.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Chemistry Textbook Part I - Class XI	Narlikar, J. V.; Khandelwal, B. L.; et al	NCERT, New Delhi, 2016, ISBN: 9788174504944
2	Chemistry Textbook Part II - Class XI	Narlikar, J. V.; Khandelwal, B. L.; et al	NCERT, New Delhi, 2015, ISBN: 9788174505354
3	Chemistry Textbook Part I - Class XII	Narlikar, J. V.; Khandelwal, B. L.; et al	NCERT, New Delhi, 2015, ISBN: 9788174506481
4	Chemistry Textbook Part II - Class XII	Narlikar, J. V.; Khandelwal, B. L.; et al	NCERT, New Delhi, 2014, ISBN: 9788174507167
5	Textbook of organic chemistry	Soni, P. L.; Chawla, H. M.	S. Chand and Sons, Delhi, 2012, ISBN: 9788180547676
6	A textbook of organic chemistry	Bahl, A.; Bahl, B. S.	S. Chand Publishing, New Delhi, 2016, ISBN: 9789352531967
7	Reaction mechanism and reagents in organic chemistry	Chatwal, G. R.	Himalaya Publishing House, New Delhi, 2015, ISBN: 9789352020898

14. SOFTWARE/LEARNING WEBSITES

a. en.wikipedia.org/wiki/Organic_chemistry

b. www.chemguide.co.uk/orgmenu.html
c. en.wikipedia.org/wiki/Functional_group
d. phet.colorado.edu/sims/html/molecule-shapes/latest/molecule-shapes_en.html
e. phet.colorado.edu/sims/html/molecule-shapes-basics/latest/molecule-shapes-basics_en.html
f. www.slideshare.net/kandarp22/organic-reactions-and-mechanisms
g. www.chemhelper.com/mechanisms.html
h. en.wikibooks.org/wiki/Organic_Chemistry/Alkanes
i. en.wikibooks.org/wiki/Organic_Chemistry/Alkenes
j. www.chem.ucalgary.ca/courses/351/Carey5th/Ch09/ch9-0.html
k. en.wikipedia.org/wiki/Alcohol
l. www.chemguide.co.uk/organicprops/alcohols/background.html
m. en.wikibooks.org/wiki/Organic_Chemistry/Alcohols
n. www.britannica.com/science/alcohol
o. www2.chemistry.msu.edu/faculty/reusch/virttxtjml/aldket1.htm
p. www.chemguide.co.uk/organicprops/carbonylmenu.html
q. www.britannica.com/science/carboxylic-acid
r. www.chemguide.co.uk/organicprops/acidmenu.html
s. www.docbrown.info/uses.htm


BOARD OF TECHNICAL EDUCATION

Program Name : **Diploma in Textile Technology**
Program Code : **TC**
Semester : **Second**
Course Title : **Physical Chemistry**
Course Code : **22242**

1. RATIONALE

In textile industry, during wet processing of textiles various chemicals are used. Physical chemistry deals with study of relations between physical properties of substances, their chemical compositions and transformation. For preparation of solutions of different concentrations, dye liquor and printing paste requires basic knowledge of physical chemistry. Effect of temperature, pressure, and pH plays vital role in every step of wet processing. Therefore, for a diploma engineer, the skills and fundamental information related to physical chemistry are essential for understanding the parameters which control textile processes such as scouring, bleaching, dyeing, printing, and finishing. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts of physical chemistry to solve broad problems in textile wet processing.

2. COMPETENCY

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

- **Solve textile processing related problems using principles of Physical Chemistry.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a. Measure concentration and pH of textile auxiliaries.
b. Prepare solutions of accurate concentrations required in textiles.
c. Correlate fundamental concepts of chemical kinetics in wet processing.
d. Choose relevant oxidizing and reducing agents for bleaching, dyeing and printing.
e. Measure heat changes occurred during chemical processing.
f. Select relevant method for separation of liquids.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
L	T	P			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.
***Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

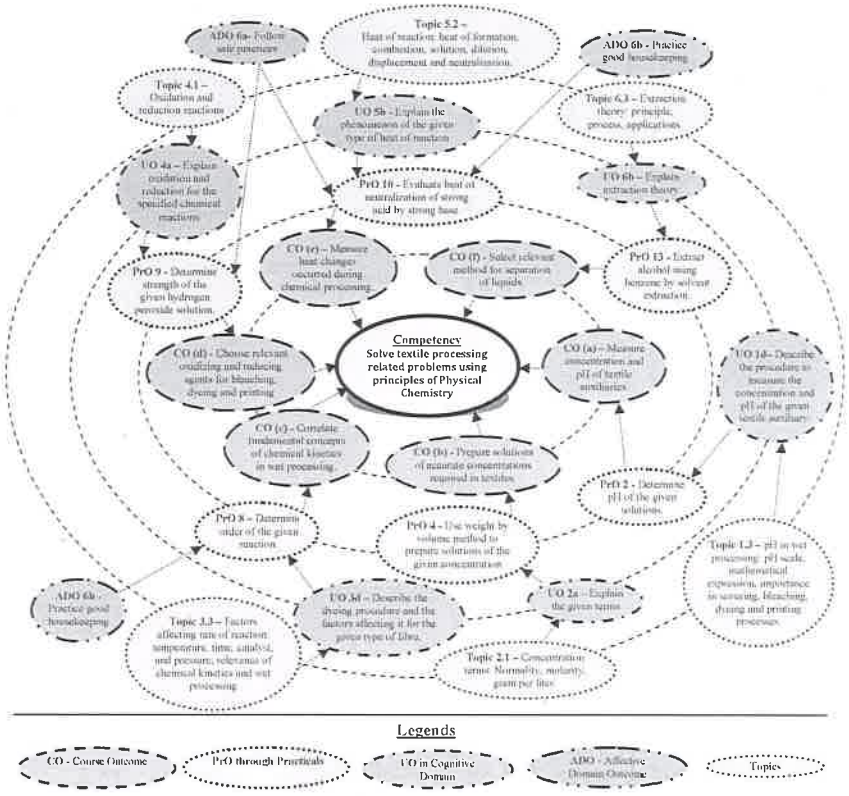

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Use standard base to determine strength of the given acid.	I	02*
2	Determine pH of the given solutions.	I	02
3	Determine nature of the given salt solutions.	I	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
4	Use weight by volume method to prepare solutions of the given concentration.	II	02*
5	Use volume by volume method to prepare solutions of the given concentration.	II	02
6	Use standard base to determine normality of the given acid.	II	02
7	Use Ostwald's viscometer to determine relative viscosity of the given liquid.	II	02
8	Determine order of the given reaction.	III	02*
9	Determine strength of the given hydrogen peroxide solution.	IV	02
10	Evaluate heat of neutralization of strong acid by strong base.	V	02*
11	Evaluate heat of displacement of copper by zinc.	V	02
12	Evaluate heat of displacement of zinc by iron.	V	02
13	Extract alcohol using benzene by solvent extraction.	VI	02*
14	Extract acetone using benzene by solvent extraction.	VI	02
	Total		**28**

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Selection of suitable component, apparatus/instrument	20
2	Preparation of experimental set up	10
3	Setting and operation	10
4	Safety measures	10
5	Observations and Recording	10
6	Interpretation of result and Conclusion	20
7	Answer to sample questions	10
8	Submission of report in time	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools, equipment, glassware and apparatus.
e. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs

according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. No.
1.	Borosilicate glass test tubes-15ml, test tube holder, test tube stand.	1,2
2.	Electronic balance with least count of 0.05 gram.	3,4
3.	Borosilicate glass Beaker (100 ml, 150 ml, 250 ml), volumetric flask (100 ml, 250 ml), soda glass- glass rod.	3,4,
4.	Thermometers- 0^0 C to 100^0 C, 0^0 C to 360^0 C, with 1^0C least count and -10^0 to 110^0 C with 0.1^0C least count	8,9,10
5.	Ostwald's viscometer 25 ml (Empties in 60 to 90 sec.)	5
6.	Borosilicate glass Pipette (10 ml, 25 ml and 10 ml, 25 ml graduated), burette (0.1 ml least count, volume 50 ml), conical flask (250 ml), burette stand	6
7.	Separating funnel with Teflon Rota flow plug, pear shape (250 ml) tripod stand.	11
8.	Chemicals – sodium hydroxide, sodium carbonate, hydrochloric acid, sulphuric acid, hydrogen peroxide, benzene, acetone, ethyl alcohol copper sulphate, zinc powder, iron powder (laboratory grade).	All

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Acids and bases	1a. Differentiate properties of the given acid and base. 1b. Determine strength of the given acid and base. 1c. Classify the given salts based on their composition. 1d. Describe the procedure to measure the concentration and pH of the given textile auxiliary.	1.1 Acids and bases: Arrhenius and Lewis concepts, differences. 1.2 Strength of acids and bases. 1.3 pH in wet processing: pH scale, mathematical expression, importance in scouring, bleaching, dyeing and printing processes. 1.4 Salts – classification, alkali/ acid liberating agents.
Unit – II Solutions	2a. Explain the given terms. 2b. Calculate molecular weight and equivalent weight of the given chemical. 2c. Describe the application of	2.1 Concentration terms: Normality, molarity, gram per liter. 2.2 Molecular weight, equivalent weight, weight by volume method, volume by volume

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	osmosis, osmotic pressure, reverse osmosis and viscosity in the given wet processing. 2d. Classify the given colloidal solution. 2e. Describe the procedure to prepare the given solution of accurate concentrations required for the given type of textile.	method. 2.3 Osmosis, osmotic pressure, reverse osmosis and viscosity in wet processing, use of Ostwald's viscometer 2.4 Colloidal solutions : classification
Unit – III Chemical kinetics and equilibrium	3a. Describe the specified type of reaction. 3b. Identify the type of reaction in the given situation. 3c. Calculate the rate of reaction for the given situation. 3d. Describe the dyeing procedure and the factors affecting it for the given type of fiber.	3.1 Types of reaction: reversible and irreversible reaction, Endothermic and Exothermic reactions. 3.2 Rate equation of chemical reaction, order of chemical reaction. 3.3 Factors affecting rate of reaction: temperature, time, catalyst, and pressure; relevance of chemical kinetics and wet processing. 3.4 Dyeing of polyester fibre at high temperature and high pressure, dyeing of cellulose fibre with cold brand reactive dye at room temperature and hot brand at 60^0 C to 80^0 C.
Unit-IV Oxidation and reduction	4a. Explain oxidation and reduction for the specified chemical reactions. 4b. Describe the properties of the given type of oxidising agent. 4c. Describe the properties of the given type of reducing agent 4d. Describe properties of the given oxidizing and/or reducing agent for the given situation.	4.1 Oxidation and reduction reactions. 4.2 Oxidising and reducing agents-hydrogen peroxide, potassium permanganate solution. 4.3 Role of oxidizing and reducing agent in wet processing (bleaching, dyeing and printing).
Unit -V Thermodynamics and thermochemistry	5a. Explain the specified law of thermodynamics. 5b. Explain the phenomenon of the given type of heat of reaction. 5c. Explain the role of thermo chemistry in the given type of wet processing. 5d. Describe the procedure to measure heat changes occurring during the specified chemical	5.1 Laws of thermodynamics: First and Second Law 5.2 Heat of reactions: heat of formation, heat of combustion, heat of solution, heat of dilution, heat of displacement and heat of neutralization. 5.3 Role of thermo chemistry in wet processing. 5.4 Procedure of measuring heat

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	processing.	changes occur during chemical processing.
Unit -VI Distribution and extraction theory	6a. Distinguish between association and dissociation of the given solute. 6b. Explain extraction theory for the given material. 6c. Describe the procedure to select relevant method for separation of the given type of miscible liquids. 6d. Explain the procedure of the separation of the given type of immiscible liquid.	6.1 Distribution law: statement, explanation and limitations. 6.2 Association and dissociation of solutes. 6.3 Extraction theory: principle, process and applications. 6.4 Immiscible liquids separation process.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Acids and bases	14	02	04	08	14
II	Solutions	12	02	04	06	12
III	Chemical kinetics and equilibrium	12	02	04	06	12
IV	Oxidation and reduction	10	02	04	06	12
V	Thermodynamics and thermochemistry	08	02	03	05	10
VI	Distribution and extraction theory.	08	02	03	05	10
Total		**64**	**12**	**22**	**36**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Measure concentration of solutions using different concentration units
b. Give seminar on any relevant topic.
c. Library survey regarding auxiliaries used in textile industry for wet processing
d. Prepare power point presentation or animation for showing osmosis, and reverse osmosis process used in water purification plant.
e. Measure temperature of different solutions using thermometers with different least count.

f. Prepare question bank referring old MSBTE question papers

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the LOs/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. Assign unit wise assignments to group of 4 to 5 students for solving problems unit wise.
g. Assign micro projects to group of 4 to 5 students and let them prepare and present the project through PPT. Group shall submit a report which is limited to 5 pages.
h. Use of video, animation films to explain concepts, facts and applications related to Physical Chemistry.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course.

In the first ***four*** semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Strength of acids and bases:** Collect bases used in textile industry and determine the strength of these bases.
b. **pH in wet processing:** Prepare chart on colour developed by universal indictor for different pH and given chemicals.
c. **Chemical auxiliaries:** Collect chemical auxiliaries used in wet processing and prepare chart including commercial name, molecular formulae and pH of chemicals.
d. **Molecular weight, equivalent weight:** Prepare chart summarizing chemicals used in textile industry their molecular weight and equivalent weight.
e. **Osmosis, osmotic pressure, reverse osmosis:** Prepare presentation explaining process of osmosis osmotic pressure in RO system.
f. **Relevance of chemical kinetics and wet processing:** Prepare chart summarizing reaction conditions required for scouring, bleaching, dyeing, and printing of different fabrics like polyester, cellulosic fabric, wool, and silk.

g. **Role of oxidizing and reducing agent in wet processing:** Prepare chart indicating different oxidizing, reducing agents used in wet processing.
h. **Heat of reactions:** Prepare solutions (acids, bases, salts, oxidizing agents reducing agents) used in textile industry, carry dilution and determine heat of reaction.
i. **Immiscible liquid separation process:** Select different combinations of solvents, separate them, note the volume and prepare chart summarizing the data.
j. **Preparation of solution:** Choose combinations of various solutes and solvents, check their solubility and summarize it in the form of chart.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Physical chemistry	Silbey, R. J.; Alberty, R.A.; Bawendi, M. G.	Wiley-India, New Delhi, 2007 ISBN: 9788126508778
2	Atkin's Physical Chemistry	Atkins, P.; Paula, J.	Oxford University Press, New Delhi, 2006, ISBN: 9780195685220
3	Physical Chemistry	Madan, R. L.	McGraw Hill Education, New Delhi,, 2015, ISBN: 9781259062544
4	Physical Chemistry: Volume I	Pahari, S.	New Central Book Agency, 2011 ISBN: 9788173814310
5	Essential of Physical Chemistry	Bahl, Arun ; Bahl, B.S.; Tuli, G. D.	S. Chand, New Delhi, 2007 ISBN: 9788121929783
6	Chemistry Textbook Part I - Class XI	Narlikar, J. V.; Khandelwal, B. L.	NCERT, New Delhi, 2015, ISBN: 817450494X
7	Chemistry Textbook Part II - Class XI	Narlikar, J. V.; Khandelwal, B. L.	NCERT, New Delhi, 2015, ISBN: 8174505350
8	Chemistry Textbook Part I - Class XII	Narlikar, J. V.; Khandelwal, B. L.	NCERT, New Delhi, 2016, ISBN: 8174506489
9	Chemistry Textbook Part II - Class XII	Narlikar, J. V.; Khandelwal, B. L.	NCERT, New Delhi, 2013, ISBN: 8174507167

14. SOFTWARE/LEARNING WEBSITES

a. phet.colorado.edu/en/simulations/category/chemistry
b. en.wikipedia.org/wiki/Physical_chemistry
c. www.chemguide.co.uk/physmenu.html
d. www.fuseschool.org/
e. alison.com/courses/Chemistry
f. textilelearner.blogspot.in/
g. www.slideshare.net/snorainy/chemistry-preparation-of-solution
h. www.gcsescience.com/gcse-chemistry-revision.htm
i. www.chemicool.com/definition/extraction.html
j. chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Redox_Chemistry

Program Name : **Diploma in Textile Technology**
Program Code : **TC**
Semester : **Second**
Course Title : **Basics of Textile Manufacturing**
Course Code : **22243**

1. RATIONALE

Diploma engineers (also called technologists) have to deal with various textile materials and machines in industries. The study of basic concepts of yarn and fabric manufacturing like blow room, carding, combing, speed frame, ring frame, looms, warp, weft etc. will help them in understanding the textile manufacturing processes where emphasis is laid on the applications of textile material. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic principles of yarn and fabric manufacturing in textile processing to solve broad based problems.

2. COMPETENCY

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

- **Use the basic principles of textile in manufacturing processes.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a. Use basic principles of preopening to produce textile material.
b. Use the principles of spinning to produce yarn.
c. Use the yarn numbering system to estimate the yarn size.
d. Select the process sequence to produce textile material.
e. Use the principles of interlacement and intermeshing to produce fabrics.
f. Use the principles of design to reproduce the textile material.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.
Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *- Practical;* ***C*** *– Credit,* ***ESE*** *- End Semester Examination;* ***PA*** *- Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

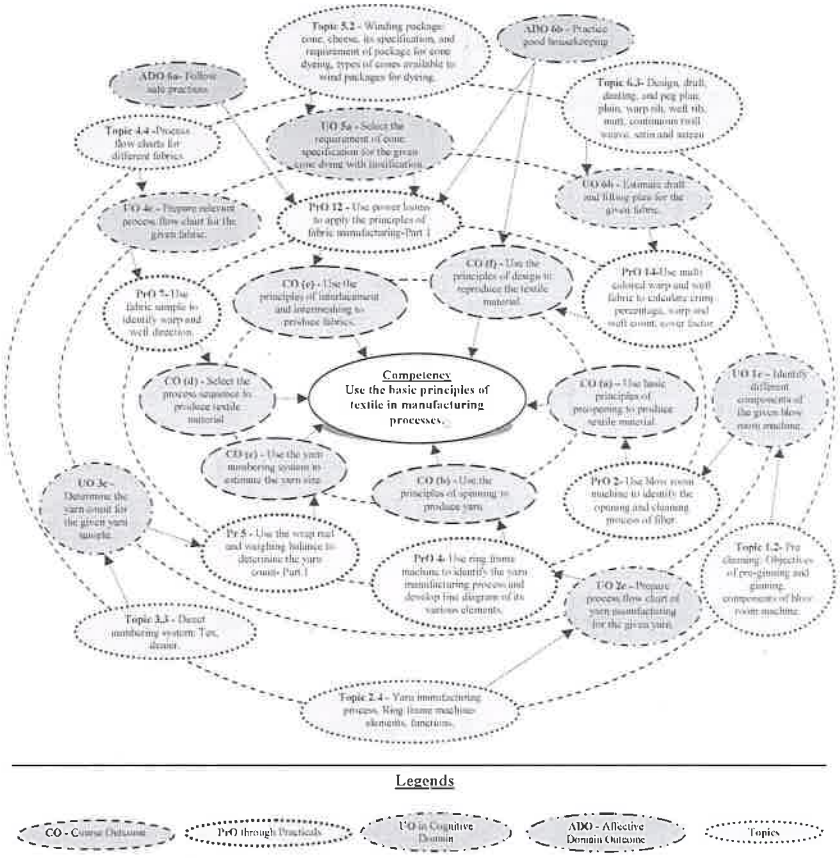

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Use carding and combing machine to identify individualization and parallisation process.	I	02*
2	Use blow room machine to identify the opening and cleaning	I	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	process of fiber.		
3	Use draw frame and fly frame machine to identify the process of roving manufacturing.	II	02*
4	Use ring frame machine to identify the yarn manufacturing process and develop line diagram of its various elements.	II	02
5	Use the wrap reel and weighing balance to determine the yarn count- Part 1	III	02*
6	Use the wrap reel and weighing balance to determine the yarn count- Part 2	III	02
7	Use fabric sample to identify warp and weft direction.	IV	02*
8	Use fabric sample to find the end per inch and picks per inch.	IV	02
9	Use winding machine to create bigger package.	IV	02
10	Use winding machine to examine the objectives of each element.	IV	02
11	Use warping machine to: (i) Inspect the passage of raw material through various elements. (ii) Calculate the creel capacity and determine beam specification.	V	02*
12	Use power looms to apply the principles of fabric manufacturing-Part 1.	IV,V	02
13	Use power looms to apply the principles of fabric manufacturing-Part 2.	IV,V	02
14	Use multi colored warp and weft fabric to calculate crimp percentage, warp and weft count, cover factor.	VI	02
15	Use multi colored warp and weft fabric to calculate warp and weft color repeat.	VI	02*
16	Use multi colored warp and weft fabric to draw design, draft and peg plan.	VI	02
	Total		**32**

Note

i. *A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. *The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:*

S. No.	Performance Indicators	Weightage in %
1	Selection of suitable component, apparatus/instrument	20
2	Preparation of experimental set up	10
3	Setting and operation	10
4	Safety measures	10
5	Observations and Recording	10
6	Interpretation of result and Conclusion	20
7	Answer to sample questions	10
8	Submission of report in time	10
	Total	100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools and equipment.
e. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year.
- 'Organising Level' in 2nd year.
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. No.
1	Ten different fabrics with different ends and picks per inch.	1, 6
2	Counting glass, needle, steel ruler (1"X1/2 inch glass,12" ruler)	2
3	Winding machine (spindle gauge 375 mm, winding speed 1000 m/min, power 0.5 hp/spindle, precision winding machine, 1.5 scroll)	2
4	Warping machine (sectional warping machine, 600 creel capacity, 600 meter/min)	3
5	Power looms (48" width, over picking, 600 mm beam flange)	4
6	Wrap reel and weighing balance	5
7	Blow room machine (stripper 1, speed 745 rpm, storage capacity 2 to 6 m^3, production rate 1300 kg/hr, power 3.8 kw)	7
8	Carding and combing machine (carding: 250 meter/min, taker in speed 1240 rpm, cylinder speed 600 rpm, flats 84,web width 995 mm, dimension 2.70X 5.40 mtr, comber- nip rate 400 NPM, lap wt 80 gm, spool dia. 650 mm, lap width 300 mm)	8
9	Draw frame, fly frame and ring frame machine (draw frame: 4 over 3 pressure bar, can size 450 mm X 1000mm,draft range 4.42 to 11.6,fly frame: no. of spindle 120, power 7.5 kw, UTM 620 drafting system, bobbin size 12 X 5 inches, spindle gauge 180mm, ring frame: lift180 mm, drafting system 4 over 4, tube length 200 mm, spindle gauge 70 mm)	9, 10

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	Spinning	
Unit – I Pre-Opening	1a. Explain cultivation process for the given textile fiber. 1b. Describe the objectives of preopening for the given fiber. 1c. Determine the essential properties of the given textile material. 1d. Classify the given types of textile fibers. 1e. Describe the function of the specified components of the blow room machine. 1f. Explain the principles of preopening to produce the given textile material.	1.1 Cotton fiber cultivation and picking 1.2 Pre cleaning: Objectives of pre-ginning and ginning, components of blow room machine. 1.3 Dimensions of bale. 1.4 Objectives of pressing. 1.5 Textile fiber: definition, essential properties, and classification. 1.6 Flow chart for carded, combed, and double yarn.
Unit– II Yarn spinning	2a. Explain the objectives of the given comber and speed frame. 2b. Describe the properties between different types of yarns in the specified type of sample. 2c. Describe the effects of changes in the specified yarn parameters. 2d. Prepare process flow chart of yarn manufacturing for the given type of yarn. 2e. Describe the procedure to apply the principles of spinning to produce the given type of yarn.	2.1 Blow room: Objectives, carding; draw frame, sliver lap and ribbon lap, comber, speed frame, ring frame 2.2 Classification of Yarn: single yarn, double yarn, staple yarn, hosiery yarn, open end yarn, ring yarn, air jet yarn, and dref yarn. 2.3 Yarn parameter: Strength, elongation, maturity, yarn count, hairiness, evenness. 2.4 Yarn manufacturing process: Ring frame machine- elements, functions.
Unit– III Yarn Numbering system.	3a. Explain the given yarn numbering system. 3b. Explain the specified yarn numbering system for the specified sample. 3c. Determine the yarn count for the specified yarn sample. 3d. Describe the procedure to use the yarn numbering system to estimate size of the given type of yarn. 3e. Calculate the yarn size by using the given yarn numbering system.	3.1 Yarn specification-Linear density 3.2 Practical difficulties in measuring the yarn diameter. 3.3 Direct numbering system: Tex, denier 3.4 Indirect numbering system-Number English, Metric, woolen, worsted, linen, French. 3.5 Simple Calculations based on above yarn numbering system. 3.6 Resultant yarn count and related calculation.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	Weaving	
Unit-IV Elements of weaving	4a. Explain properties of the given type of fabric 4b. Describe the methods of production for the given type of fabric. 4c. Prepare relevant process flow chart for the given type of fabric. 4d. Describe applications of the given type of loom. 4e. Describe the features of the given types of looms. 4f. Describe the process sequence to produce the given textile material.	4.1 Fabric: warp, weft 4.2 Methods to produce fabric; weaving, knitting, braiding, felting, non-woven. 4.3 Objectives: Winding, warping, sizing, drawing-in, cone dyeing, beam dyeing, pirn winding, weaving. 4.4 Process flow chart for different fabrics: a) Grey fabric b) Mono color fabric (dyed warp and gray weft), c) Warp or weft stripes d) pattern, e) warp and weft both colored. 4.5 Classification of looms.
Unit –V Preparatory and Principles of weaving	**Preparatory:** 5a. Select the requirement of cone specification for the given cone dying with justification. 5b. Explain the procedure to identify the different types of yarn defects in the given samples. 5c. Explain the procedure to determine the creel capacity for the given sample. 5d. Explain the procedure to select beam specification for the given beam dyeing with justification. 5e. Explain the functions of drawing in process.	5.1 Objectives of winding, types of winding 5.2 Winding package: cone, cheese, its specification, requirement of package for cone dyeing, types of cones available to wind packages for dyeing. 5.3 Information of Classimat chart. 5.4 Warping: objectives, passage of warp, through the machine, types of warping, creel capacity and its effect, quality requirement of warping beam, beam defects, requirement of package for beam dyeing. 5.5 Sizing: Objective, importance, passage of warp, stretch, size pick up and size add-on, specification of sized beam. 5.6 Drawing-in: objective, draft, drawing in order, reed.
	Principles of weaving: 5f. Explain the procedure to identify various elements of the given fabric. 5g. Describe the given shedding mechanisms. 5h. Describe the given type of picking. 5i. Describe the implications of	5.7 Element of fabric; EPI, PPI, cover factor, GSM, crimp percentage, interlacement selvedge type 5.8 Shedding; objective, plain, dobby, jacquard Picking; shuttle, projectile, rapier, air jet. Beat up: objective. Take up and Let off. 5.9 Knitted fabric: warp and weft knitted fabrics, loop structure, type

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	the specified type of defects. 5j. Describe the principle of interlacement and intermeshing to produce the given fabric.	of knitted fabric. Comparison of knitted and woven fabrics, properties of knitted fabrics. 5.10 Non-woven: Structure, Mechanical Needle punching 5.11 Fabric inspection: Defects, grading system, cut looking.
Unit-VI Fabric structure	6a. Describe the design process for the specified fabric. 6b. Estimate draft plan for the specified fabric. 6c. Estimate lifting plan for the specified fabric. 6d. Describe the process of design to produce the given textile material.	6.1 Interlacements, method to represent on paper, design, draft, lifting plan, denting, weave repeat. 6.2 Concept of crimp, cover factor 6.3 Design, draft, denting, and peg plan: plain , warp rib, weft rib, matt, continuous twill weave, satin and sateen

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Spinning					
I	Pre opening	08	02	04	06	12
II	Yarn spinning	12	04	06	02	12
III	Yarn numbering system	12	04	04	04	12
	Weaving					
IV	Elements of weaving	08	02	02	06	10
V	Preparatory and Principle of weaving	14	02	04	06	12
VI	Fabric structure	10	04	02	06	12
	Total	**64**	**18**	**22**	**30**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Measure yarn count and calculate count and tex numbering system.
b. Give seminar on any relevant topic.

c. Library survey regarding application of various fabrics.
d. Prepare presentation for showing different types yarns, fabric, and method to produce the fabric.
e. Undertake a market survey of different types of fabric.
f. Prepare question bank referring old MSBTE question papers

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the LOs/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. Assign unit wise assignment to group of 4 to 5 students for solving problems unit wise.
g. Assign micro projects to group of 4 to 5 students and let them prepare and present the project through PPT. Group shall submit a report which is limited to 5 pages.
h. Use of video, animation films to explain concepts, facts and applications related to spinning and weaving.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Pre-opening:** Take photographs of various stages of cultivation and preopening process and prepare booklet/ presentation by labeling objective of each process.
b. **Yarn spinning:** Collect different types of yarn sample and prepare booklet/ presentation by giving information related to collected sample.
c. **Yarn spinning:** Collect photographs of each machine required for yarn manufacturing and prepare presentation by listing objective of each process.
d. **Yarn numbering system:** Collect different sizes of yarns and prepare black card sheet by labeling their yarn numbers in tex and Ne.

e. **Principle of weaving**: Prepare flow chart diagrams for various processes required for producing different types of fabric.
f. **Fabric structure:** Collect samples of different fabric weaves and prepare fabric sample folder by labeling weave type.
g. **Principle of weaving**: Prepare specification table of requirements of package dimensions and parameters required for cone, beam dyeing.
h. **Fabric structure:** Collect round flexible metallic colored wire and interlace in different weave order to produce plain, twill, satin weave.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	The Technology of short staple spinning	Werner, Klein	The Textile Institute, Manchester, 1986, ISBN: 1870812988
2	Spinning	Lord, P.R.	Woodhead Publications, Ahmedabad, 1970 ISBN:1855739771
3	Spinning of Manmade and Blends on cotton spinning	Salotra, K.R.	The Textile Association of India, 2016, ISBN: 818932800X
4	Spun Yarn Technology	Oxberg, Eric	Butterworths (Publishers) Limited, 1983, ISBN: 0408014644
5	Weaving Conversion of Yarns to Fabric	Lord, P.R	Woodhead Publication, Ahmedabad, 1982, ISBN: 1855734834
6	Principle of Weaving	Marks & Robbinson	The Textile Institute, 1976, ISBN: 0900739797
7	Weaving: Machines, Mechanisms, Management	Talukdar, M.K: Ajgaonkar, D.B: Sriramulu, P.K	Mahajan Publisher Private Limited, India,1998, ISBN: 8185401160
8	Modern Preparation and Weaving Technology	Ormerod, A.	Butterworth, (Publishers) Limited, 1985 ISBN: 9780408012126

14. SOFTWARE/LEARNING WEBSITES

a. nptel.ac.in/courses/116102005/48
b. nptel.ac.in/courses/116102005/49
c. www.textbooksonline.tn.nic.in/books/11/stdxi-voc-textiles-em.pdf
d. en.wikipedia.org/wiki/Textile_manufacturing
e. nptel.ac.in/courses/116102005/49
f. www.textbooksonline.tn.nic.in/books/11/stdxi-voc-textiles-em.pdf
g. en.wikipedia.org/wiki/Textile_manufacturing
h. www.textileschool.com/articles/109/blow-room-functions
i. textilelearner.blogspot.in/2011/07/basic-operations-in-blowroom_485.html
j. textilelearner.blogspot.in/2011/03/blowroom-objects-of-blow-room-basic_2485.html
k. www.rieter.com/cz/rikipedia/articles/rotor-spinning/applications-engineering/preparation-of-raw-material/the-processing-stages/blowroom/


MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

Program Name: All Branches of Diploma in Engineering and Technology.

Program Code: CE/CR/CS/CH/PS/CM/CO/IF/CW/DE/EJ/EN/EQ/ET/EX/IE/MU/EE/ EP/EU/IS/IC/AE /FG/ME/PG/PT/DC/TX/TC

Semester : Second

Course Title : Business Communication Using Computers

Course Code : 22009

1. RATIONALE

Communication is the key factor for smooth and efficient functioning of any industry or business activity. Effective business communication is the lifeblood of any organization and is required to maintain quality and progress. The efficacy of business communication skills are essential for engineering professionals for instructing, guiding and motivating subordinates to achieve desired goals at work place. It is very crucial for an entrepreneur to run organization successfully by communicating effectively and skillfully with employees, customers and investors. Thus this course has been designed to enhance the skills to '*Communicate effectively and skillfully at workplace.*'

2. COMPETENCY

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

- **Communicate effectively and skillfully at workplace.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above-mentioned competency:

a. Communicate effectively by avoiding barriers in various formal and informal situations.
b. Communicate skillfully using non-verbal methods of communication.
c. Give presentations by using audio- visual aids.
d. Write reports using correct guidelines.
e. Compose e-mail and formal business letters.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
--	--	2	2	--	--	--	--	--	--	--	35@^	14	15~	06	50	20

(~[1]): For only practical courses, the PA (15 marks) has two components under practical marks i.e. the assessment of practical has a weightage of 60% (i.e.09 marks) and micro-project assessment has a weightage of 40% (i.e.06 marks). This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

Legends: *L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

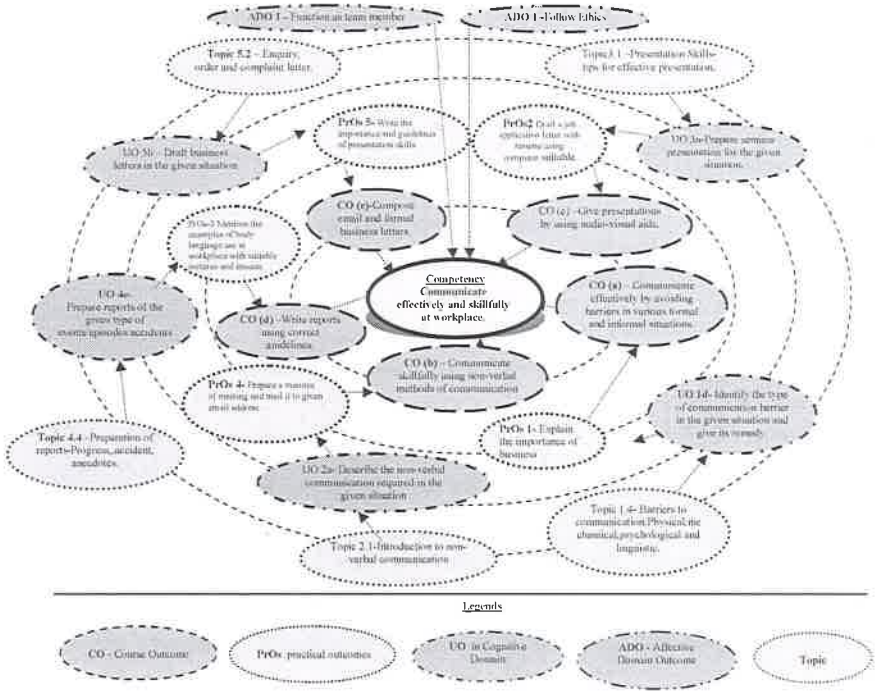

Figure 1 - Course Map

6. SUGGESTED PRACTICALS ACTIVITIES / EXERCISES (Integrate the theory in the laboratory when conducting practical)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Explain the importance of business communication for an organization using case study	I	2*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
2	Draft a job application letter with resume using computer.	V	2*
3	Mention the examples of body language use at workplace with suitable pictures and images.	II	2*
4	Prepare a minutes of meeting and mail it to given email address	VI	2
5	Write the importance and guidelines of presentation skills.	III	2*
6	Draft a detailed Progress Report.	IV	2*
7	Organize a debate on types of communication.	I & III	2
8	Summarize an industry report using techniques of summarizing.	IV	2
9	Draft a complaint letter on given topic.	V	2
10	Design PowerPoint presentation on any technical topic.	III	2*
11	Explain the eight principles of effective communication.	I	2*
12	Explain various non-verbal codes with examples.	II	2
13	Explain the importance of personal appearance stating tips of grooming for a professional.	II	2*
14	Draft a memo on given topic.	V	2
15	Present any Two barriers to communication using case study.	I	2*
16	Present a technical paper using IEEE format.	III	2*
			32

Note

i. A suggestive list of practical LOs is given in the above table, more such practical LOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical LOs/tutorials need to be performed, out of which, the practicals marked as '' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry. The size of batch for the practical should not exceed more than 21 students strictly for the maximum attainment of COs and PrOs.*

ii. Hence, the 'Process' and 'Product' related skills associated with each LO of the laboratory/workshop/field work are to be assessed according to a suggested sample given below:

7. MAJOR EQUIPMENTS / INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. S.No.
1	LCD Projector	All
2	Smart Board with networking	All
3	Language lab with internet	All
4	Printer	Wherever Applicable

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)		Topics and Sub-topics
	Writing Skills	Speaking Skills	
Unit – I Introduction to Business Communication	1a. Describe the importance of the business communication in the given situation. 1b. Identify the missing element in the given communication process. 1c. Identify the type of communication in the given situation. 1d. Identify the type of communication barrier in the given situation and its remedy.	1e. Use different types of verbal and non–verbal communication for the given situation.	1.1 Introduction to Communication- Elements, Importance. Functions. 1.2 Types (meaning and importance) –Verbal (Oral-Written), Formal, Informal, Vertical, Horizontal and Diagonal communication. 1.3 Principles of effective communication. 1.4 Barriers to communication - Physical, mechanical, psychological and linguistic. 1.5 Business communication: Meaning, characteristics and importance.
Unit– II Non-Verbal Communication	2a. Describe the non-verbal communication required in the given situation. 2b. Describe personal appearance required in the given communication situation. 2c. Describe the given facial expressions.	2d. Use relevant facial expressions in the given situation. 2e. Answer questions after listening to presentations.	2.1 Introduction to Non-Verbal communication (Meaning and importance) 2.2 Body Language: Aspects of body language: gestures, eye contact, posture, facial expressions, personal appearance (dressing and grooming) vocalics. 2.3 Body language - positive and negative body language.
Unit– III Presentation skills	3a. Prepare seminar presentation for the given situation. 3b. Prepare debate points 'for' and 'against' the given topic. 3c. Prepare the points for computer presentation	3d. Make seminar presentation 3e. Participate in debate speaking 'for' or 'against' the given topic. 3f. Make effective	3.1 Presentation skills- tips for effective presentation. 3.2 Guidelines for developing power point presentation. 3.3 Presenting Technical papers.

Unit	Unit Outcomes (UOs) (in cognitive domain)		Topics and Sub-topics
	Writing Skills	Speaking Skills	
	for the given topic.	computer presentations	
Unit– IV Office Drafting	4a. Draft the given notice using the relevant format. 4b. Draft the given memorandum using the relevant format. 4c. Prepare agenda for the given type of meetings. 4d. Prepare minutes of the given type of meetings. 4e. Prepare reports of the given type of events/episodes/ accidents	4f. Read the agenda of the given meeting. 4g. Read the report of the given event. 4h. Initiate telephone calls for given situation. 4i. Answer official phone calls for given situation.	4.1. Office drafting: Formats and Guidelines. 4.2. Formulating notices and memoranda. 4.3. Preparation of agenda and writing minutes of meetings. 4.4. Preparation of reports- progress reports, Accident reports, case study. 4.5. Summarizing techniques.
Unit-V Business Correspondence	5a. Respond to given job advertisements by writing your CV/ Resume. 5b. Draft business letters in the given situations. 5c. Draft complaint letters for the given situations. 5d. Compose E- mails with relevant for the given situation.		5.1 Business correspondence. 5.2 Enquiry, order and complaint letters. 5.3 E-mails- netiquettes. 5.4 Difference –Curriculum Vitae, Bio-data and Resume. 5.5 Job application and resume writing

Note: To attain the COs and competency, above listed Learning Outcomes (UOs) need to be undertaken to achieve the 'Application Level' of Blooms's 'Cognitive Domain Taxonomy' Theory related topic should be covered during practical hours using multimedia.

9. SUGGESTED SPECIFICATION TABLE FOR INTERNAL END SEMISTER EXAMINATION

Unit No.	Unit Title	Distribution of practical Marks			
		R Level	U Level	A Level	Total Marks
I	Introduction to Business Communication	02	02	01	05
II	Non-verbal Communication	02	01	02	05
III	Presentation Skills	02	01	02	05
IV	Office Drafting	02	04	04	10
V	Business Correspondence	02	04	04	10
	Total	**10**	**12**	**13**	**35**

***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 PrOs and UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED GUIDELINES FOR ASSESSMENT TOOL TO CONDUCT INTERNAL END SEMETER EXAM (ESE) .

Weightage (20 Marks) A	Weightage (15 Marks) B	Total
Assessment based on PrOs, practicals conducted during semester Based on computer and written skill. (Minimum four questions each five marks) Sample questions: Eg. I Draft an email to The manager regarding the shortage of raw material at production department. Note-submit the printout of mail. (Computer based) **Eg. II Write job application with resume. (written)**	**Oral examination based on UOs Topics mentioned in syllabus. (Minimum five questions each two marks to be asked) Eg. I Explain the importance of communication in professional life. II. State any four guidelines of presentation skills.**	**(35 Marks) A+B** **Duration: 2 hours**

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:

a. Collect good articles from newspapers and magazines and read them with correct intonation.
b. Listen to Business news on TV and radio.
c. Watch videos of effective presentations on television and open learning sources for presentation skills and body language.
d. Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

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

b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
a. Arrange various communication activities using functional grammar.
b. Show video/animation films to develop listening skills and enhance vocabulary.
c. Use real life situations for explanation.
d. Prepare and give oral presentations.
e. Guide micro-projects in groups as well as individually.

12. SUGGESTED TITLES OF MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of CrAs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement*** hours during the course.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Study the personal appearance and grooming of employees visiting sales store, shopping mall in the vicinity.
b. Comparative study of Bio-data, Resume and Curriculum vitae.
c. A detailed study of guidelines required for presentation skills.
d. Summarize technical content using English newspaper, magazines or online resources.
e. Prepare a booklet on aspects of body language in pictorial form.
f. A detailed study of the importance, of technical paper of technical paper presentation.
g. Case study on the importance of Business communication in an organization.
h. Report on various formal/business activities.
i. Study of oral presentation of famous business leader.
j. Detailed study of business etiquettes observed in organization.
k. Summarize the business article with the help of English newspapers/magazines and other sources.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill

S. No.	Title of Book	Author	Publication
2	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press
3	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press

14. SOFTWARE/LEARNING WEBSITES

a. https://www.britishcouncil.in/english/learn-online
b. http://learnenglish.britishcouncil.org/en/content
c. http://www.talkenglish.com/
d. languagelabsystem.com
e. www.wordsworthelt.com
f. www.notesdesk.com
g. http://www.tutorialspoint.com
h. www.studylecturenotes.com
i. totalcommunicator.com
j. www.speaking-tips.com

Program Name : **Diploma in Textile Technology**

Program Code : **TC**

Semester : **Second**

Course Title : **Textile Design and Color**

Course Code : **22018**

1. RATIONALE

Designing for textile is an important activity for any textile engineer. The knowledge of basic elements such as lines, shapes, sizes, colors and textures, principles of designing and textile designing skills are essential components of any textile programme. This course will help the diploma engineer to develop industrial designs using basic elements and principles of designing. Knowledge and relevant skills related to color theory will prepare them to perform dyeing and printing operations effectively. Computer aided design systems will help them to develop precise designs with better visualisation. This course is developed in the way by which fundamental information will help the diploma engineers to apply the basic concepts of textile color and design in various textile processes and in solving broad based textile designing problems.

2. COMPETENCY

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

- **Develop textile designs with colour using CAD software.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a. Use elements of art for textile designing.
b. Create designs using different principles of design.
c. Develop textile design using color theories and harmonies.
d. Compose various textile designs for different end uses.
e. Develop engineering drawing using CAD software for surface designing.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	-	2	3	--	--	--	--	--	--	--	25@	10	25~	10	50	20

*(~[1]): For the courses having **ONLY practical** examination, the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e. 15 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e. 10 marks). This is designed to facilitate attainment of COs holistically, as there is no theory ESE.*

***Legends:** **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

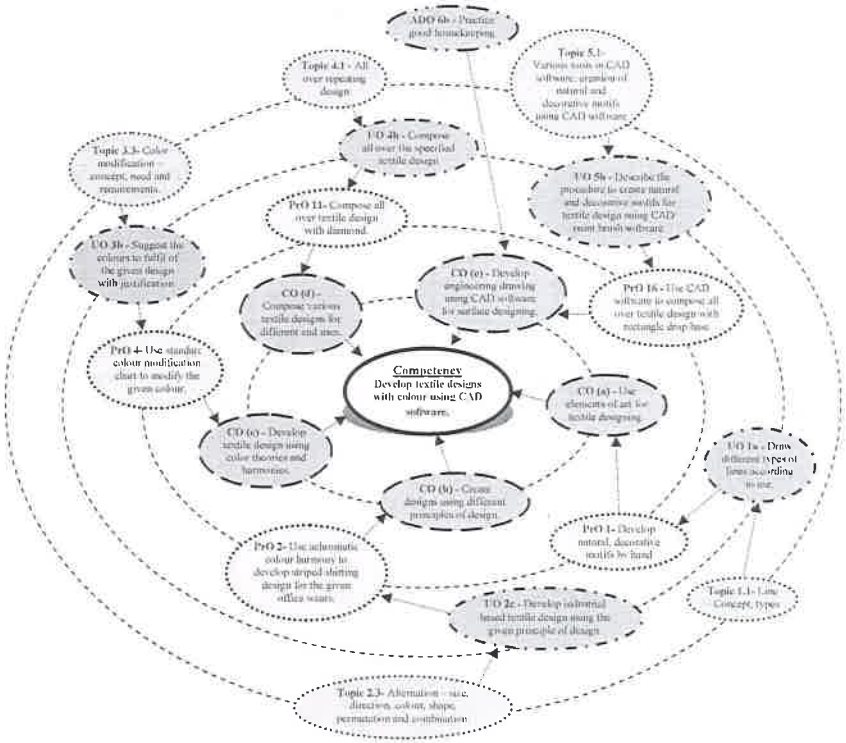

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	Develop natural, decorative motifs by hand	I	02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
2	Use achromatic colour harmony to develop striped shirting design for the given office wears.	II, III	02*
3	Use monochromatic colour harmony to develop checks shirting design for the given casual wear.	II, III	02
4	Use the given analogues color harmony to develop curtain material design.	II, III	02
5	Use the given complementary color harmony to develop ladies dress material design.	II, III	02
6	Use the given polychromatic color harmony to develop kids wears design.	II, III	02
7	Use standard colour modification chart to modify the given colour.	III	02*
8	Develop the chart for light theory of colour.	III	02
9	Develop the chart for pigment theory of colour.	III	02
10	Develop tints, tones, and shades of any two given colors.	III	02
11	Compose all over textile design with diamond.	IV	02*
12	Compose all over textile design with ogee base.	IV	02
13	Compose all over textile design with sateen.	IV	02
14	Use CAD software to compose all over textile design with half drop base.	IV,V	02*
15	Use CAD software to compose all over textile design with full drop base.	IV,V	02
16	Use CAD software to compose all over textile design with rectangle drop base.	IV,V	02
	Total		**32**

Note

*i. A suggestive list of **PrOs** is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practicals need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Preparation of design assignment	20
2	Planning and visualization of design	20
3	Safety measures	10
4	Accuracy and neatness	10
5	Final design output	20
6	Answer to sample questions	10
7	Submission of design in time	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools and equipment.
e. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	Exp. No.
1	Pencil – HB, Tracing paper – gate way quality, Drawing sheet – A4 size, Poster colour, Coloring brush – round (0, 2, 4), flat (1/2"), Bow pen, Bow compass.	1 to 13
2	Wonder weave system software	14 to 16
3	Computer with 21" flat screen monitor (20 Nos.) (Intel core i7/ RAM 16 GB/ 1TB HDD/ Static Drive/ Windows 10)	14 to 16
4	AutoCAD Software with licenses (20 Nos.)	14 to 16
5	Corel Draw Latest version software with licenses (20 Nos.)	14 to 16
6	High speed Internet connectivity for all the computer systems (20 Nos.)	14 to 16

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Elements of art	1a. Draw the given types of lines according to use. 1b. Identify the direction and shape of the given motifs. 1c. Develop specified design using the given sizes, forms and texture. 1d. Describe the procedure to create the specified colour values. 1e. Describe procedure to use the	Elements of art: 1.1 Line – concept, types. 1.2 Direction – types. 1.3 Shape – definition, types. 1.4 Size – concept, types. 1.5 Texture – concept and application. 1.6 Value – concept, use. 1.7 Colour – definition, sensation

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	specified elements of art for textile designing.	process and use. 1.8 Form – concept, use. 1.9 Design concept
Unit– II Principles of design	2a. Explain the relevant principles of design for the specified application. 2b. Describe procedure to create a design using the specified principle of design. 2c. Describe procedure to develop industrial based textile design using the given principle of design. 2d. Describe procedure to develop the specified design using permutation and combination of the given elements.	2.1 Various principles of design. 2.2 Repetition – technical concept 2.3 Alternation – size, direction, colour, shape, permutation and combination. 2.4 Harmony – pure and discord. 2.5 Gradation – shape, size and colour. 2.6 Contrast – colour and value. 2.7 Unity – concept development. 2.8 Balance – formal and informal balance. 2.9 Dominance and sub-ordination – concept and application.
Unit– III Colour theories and harmonies	3a. Describe the specified light theory. 3b. Suggest the colours to fulfil of the given design with justification. 3c. Describe procedure to develop specified design with various colour harmonies. 3d. Interpret the effect of the specified textile substrate on appearance of colour. 3e. Describe procedure to develop the specified textile design using colour theories and harmonies.	3.1 Light theory of colour – chromatic circle, colour vision 3.2 Pigment theory of colour – colour wheel, attributes of primary and secondary colours. 3.3 Color modification – concept, need and requirements. 3.4 Color harmony – achromatic, monochromatic, analogues, complementary, polychromatic. 3.5 Effect of textile substrate on appearance of colour.
Unit-IV Composition of textile design	4a. Describe procedure to compose specified textile design for the given application/ end use. 4b. Describe procedure to compose all over the specified textile design. 4c. Describe procedure to construct relevant design with the given bases.	4.1 All over repeating design. 4.2 Drop based designs – half, full, drop reverse and universe, diamond base, ogee base, sateen base (regular and irregular).
Unit-V Computer aided design	5a. Describe procedure to develop engineering drawing using CAD software for the given surface designing. 5b. Describe the procedure to create natural and decorative motifs for textile design using CAD/ paint	5.1 Various tools in CAD software; creation of natural and decorative motifs using CAD software. 5.2 Paint brush tools and applications. 5.3 Wonder weave system tools

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	brush software. 5c. Describe the procedure to use the wonder weave system to create composition of the given design with different bases.	and applications.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

- Not Applicable -

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Identify the types of line and their characteristics from textile design and prepare presentation.
b. Identify and compare different principles of designs from different fabrics and prepare presentation.
c. Collect printed textile design and prepare presentation.
d. Collect samples of various designs used in different garments and prepare presentation.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e. Guide student(s) in undertaking micro-projects.
f. Assign unit wise assignments to group of 4 to 5 students for solving problems unit wise.
g. Assign micro projects to group of 4 to 5 students and let them prepare and present the project through PPT. Group shall submit a report which is limited to 5 pages.
h. Use of video, animation films to explain concepts, facts and applications related to textile color and design.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in

fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course.

In the first ***four*** semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Line:** Develop the decorative motifs using different line characteristics.
b. **Elements of art:** Develop the designs using combination of elements of art.
c. **Principles of textile design**: Select twenty different fabrics and classify the designs as woven and printed. Prepare presentation based on classification.
d. **Colour theories:** Select fifty different fabrics and identify the colour harmony, prepare presentation.
e. **Colour trends:** Collect fifteen colour images of current colour trends of textile design, prepare presentation.
f. **Design trends:** Collect fifteen colour images of current design trends of textile design, prepare presentation.
g. **Shirting designs:** Collect fifteen colour images of shirting designs based on casual wear, formal wear and party wear.
h. **Dress material designs:** Collect fifteen colour images of dress material design.
i. **Furnishing designs:** Collect fifteen colour images of furnishing designs.
j. **Curtain designs:** Collect fifteen colour images of curtain design.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Watson's textile design and colour	Grosicki, Z.	Universal Publishing Corporation – London, 1975, ISBN: 9781855739956
2	Textile Designs: 200 Years of Patterns for Printed Fabrics Arranged by Motif, Colour, Period and Design	Meller, S.; Elffers, J.; Croner, T.	Thames & Hudson Ltd., 2002, ISBN: 9780500283653
3	Textile Motifs of India (Fashion & Textiles)	Press, Pepin	Agile Rabbit, 2008, ISBN: 9789057680755
4	History of textile design.	Shenai, V. A.	Sevak Publication, Mumbai, 1992.
5	Instruction package on application of art and design to textile.	Sadhale, C. R.	Private circulation TTTI, Bhopal and DKTE, Ichalkaranji.

14. SOFTWARE/ LEARNING WEBSITES

a. www.gutenberg.org/etext/25290
b. www.getty.edu/education/for_teachers/building_lessons/elements.html
c. en.wikipedia.org/wiki/Visual_design_elements_and_principles
d. www.colormatters.com/color-and-design/basic-color-theory
e. en.wikipedia.org/wiki/Theory_of_Colours
f. cs.nyu.edu/courses/fall02/V22.0380-001/color_theory.htm
g. www.tigercolor.com/color-lab/color-theory/color-harmonies.htm
h. www.amazon.in/Revised-Textile-Practical-Composition.../1172579512
i. www.hw.ac.uk/schools/textiles-design/industry.../cad.htm
j. www.slideshare.net/victorroy71/application-of-computer-in-textiles

15. COURSE CURRICULUM DEVELOPMENT COMMITTEE

MSBTE Resource Persons

S. No.	Name and Designation	Institute	Contact No.	Email
1	Mr. C. R. Sadhale, Sr. Lecturer	DKTE's Textile and Engineering Institute, Ichalkaranji.	9545789541	shekhar001234@gmail.com
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3	Mr. Sanjay A. Shetti, Lecturer	DKTE's Textile and Engineering Institute, Ichalkaranji.	8983518144	sanjayshetti@gmail.com

NITTTR Bhopal Resource Person

S. No.	Name and Designation	Department	Contact No.	Email
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