 <b>MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI</b> <b>TEACHING AND EXAMINATION SCHEME</b>																	
<b>COURSE NAME : DIPLOMA IN TEXTILE TECHNOLOGY</b>																	
<b>COURSE CODE : TC</b>																	
<b>DURATION OF COURSE : SIX SEMESTERS</b>										<b>WITH EFFECT FROM : 2012-13</b>							
<b>SEMESTER : FOURTH</b>										<b>DURATION : 16 WEEKS</b>							
<b>PATTERN : FULL TIME - SEMESTER</b>										<b>SCHEME : G</b>							
SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17400)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Environmental Studies \$	EST	17401	01	--	02	01	50#*	20	--	--	--	--	25@	10	<b>50</b>	
2	Technology of Dyeing-I	TOD	17467	04	--	03	03	100	40	50#	20	--	--	25@	10		
3	Technology of Printing-I	TOP	17468	04	--	03	03	100	40	50#	20	--	--	25@	10		
4	Technology of Finishing-I	TOF	17469	03	--	03	03	100	40	--	--	25#	10	25@	10		
5	Elements of Chemical Engg. Operation	ECH	17470	03	--	--	03	100	40	--	--	--	--	--	--		
6	Textile Testing	TTE	17471	03	--	02	03	100	40	--	--	--	--	25@	10		
7	Professional Practices-II	PPS	17052	--	--	03	--	--	--	--	--	--	--	50@	20		
8	Industrial Training	ITR	17053	--	--	**	--	--	--	--	--	--	--	--	--		
<b>TOTAL</b>				<b>18</b>	<b>--</b>	<b>16</b>	<b>--</b>	<b>550</b>	<b>--</b>	<b>100</b>	<b>--</b>	<b>25</b>	<b>--</b>	<b>175</b>	<b>--</b>	<b>50</b>	

Student Contact Hours Per Week: **34 Hrs.**  
**THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.**  
Total Marks : **900**  
@ Internal Assessment, # External Assessment, \$ Common to All Conventional Diploma,   No Theory Examination, \*\* Industrial Training for six weeks to be completed during summer break after Fourth semester. Assessment to be done in Fifth Semester.  
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subject are to be converted out of 100 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

**Course Name : All Branches of Diploma in Engineering & Technology**

**Course Code : AE/CE/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/  
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/AU/FG**

**Semester : Fourth**

**Subject Title : Environmental Studies**

**Subject Code : 17401**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25@	75

**#\* Online Theory Examination**

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding. We are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as

overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

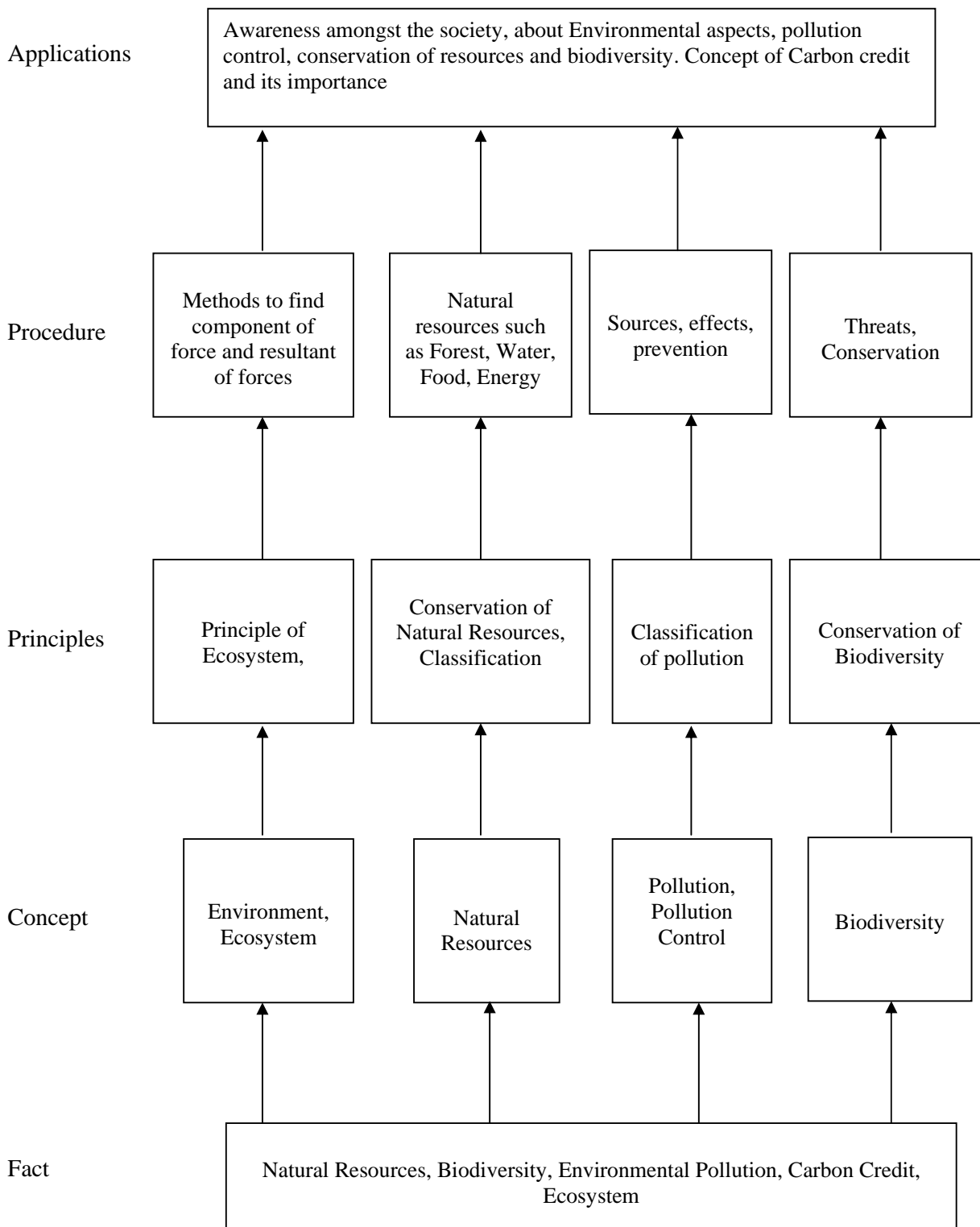
It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

**General Objectives:** The student will be able to,

1. Understand importance of environment
2. Know key issues about environment
3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

**Learning Structure:**



**Theory:**

<b>Topic and Contents</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1: Nature of Environmental Studies</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Define the terms related to Environmental Studies</li> <li>➤ State importance of awareness about environment in general public</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Definition, Scope and Importance of the environmental studies</li> <li>• Importance of the studies irrespective of course</li> <li>• Need for creating public awareness about environmental issues</li> </ul>	01	04
<p><b>Topic 2: Natural Resources and Associated Problems</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Define natural resources and identify problems associated with them</li> <li>➤ Identify uses and their overexploitation</li> <li>➤ Identify alternate resources and their importance for environment</li> </ul> <p><b>Contents:</b></p> <p>2.1 Renewable and Non renewable resources</p> <ul style="list-style-type: none"> <li>• Definition</li> <li>• Associated problems</li> </ul> <p>2.2 Forest Resources</p> <ul style="list-style-type: none"> <li>• General description of forest resources</li> <li>• Functions and benefits of forest resources</li> <li>• Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc.</li> </ul> <p>2.3 Water Resources</p> <ul style="list-style-type: none"> <li>• Hydrosphere: Different sources of water</li> <li>• Use and overexploitation of surface and ground water</li> <li>• Effect of floods, draught, dams etc. on water resources and community</li> </ul> <p>2.4 Mineral Resources:</p> <ul style="list-style-type: none"> <li>• Categories of mineral resources</li> <li>• Basics of mining activities</li> <li>• Mine safety</li> <li>• Effect of mining on environment</li> </ul> <p>2.5 Food Resources:</p> <ul style="list-style-type: none"> <li>• Food for all</li> <li>• Effects of modern agriculture</li> <li>• World food problem</li> </ul>	04	10
<p><b>Topic 3. Ecosystems</b></p> <ul style="list-style-type: none"> <li>• Concept of Ecosystem</li> <li>• Structure and functions of ecosystem</li> <li>• Energy flow in ecosystem</li> <li>• Major ecosystems in the world</li> </ul>	01	04
<p><b>Topic 4. Biodiversity and Its Conservation</b></p> <ul style="list-style-type: none"> <li>• Definition of Biodiversity</li> <li>• Levels of biodiversity</li> <li>• Value of biodiversity</li> <li>• Threats to biodiversity</li> </ul>	02	06

<ul style="list-style-type: none"> <li>• Conservation of biodiversity</li> </ul>		
<b>Topic 5. Environmental Pollution</b> <ul style="list-style-type: none"> <li>• Definition</li> <li>• Air pollution: Definition, Classification, sources, effects, prevention</li> <li>• Water Pollution: Definition, Classification, sources, effects, prevention</li> <li>• Soil Pollution: Definition, sources, effects, prevention</li> <li>• Noise Pollution: Definition, sources, effects, prevention</li> </ul>	03	08
<b>Topic 6. Social Issues and Environment</b> <ul style="list-style-type: none"> <li>• Concept of development, sustainable development</li> <li>• Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits</li> <li>• Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate</li> <li>• Concept of Carbon Credits and its advantages</li> </ul>	03	10
<b>Topic 7. Environmental Protection</b> Brief description of the following acts and their provisions: <ul style="list-style-type: none"> <li>• Environmental Protection Act</li> <li>• Air (Prevention and Control of Pollution) Act</li> <li>• Water (Prevention and Control of Pollution) Act</li> <li>• Wildlife Protection Act</li> <li>• Forest Conservation Act</li> </ul> Population Growth: Aspects, importance and effect on environment <ul style="list-style-type: none"> <li>• Human Health and Human Rights</li> </ul>	02	08
<b>Total</b>	<b>16</b>	<b>50</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

1. Collection of information, data
2. Analysis of data
3. Report writing

**Motor Skills:**

1. Presentation Skills
2. Use of multi media

**List of Projects:**

**Note:** Any one project of the following:

1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems of ponds, river, hill slopes etc

**Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.**

**Learning Resources:**

**Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Technology of Dyeing-I**

**Subject Code : 17467**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	03	03	100	50#	--	25@	175

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

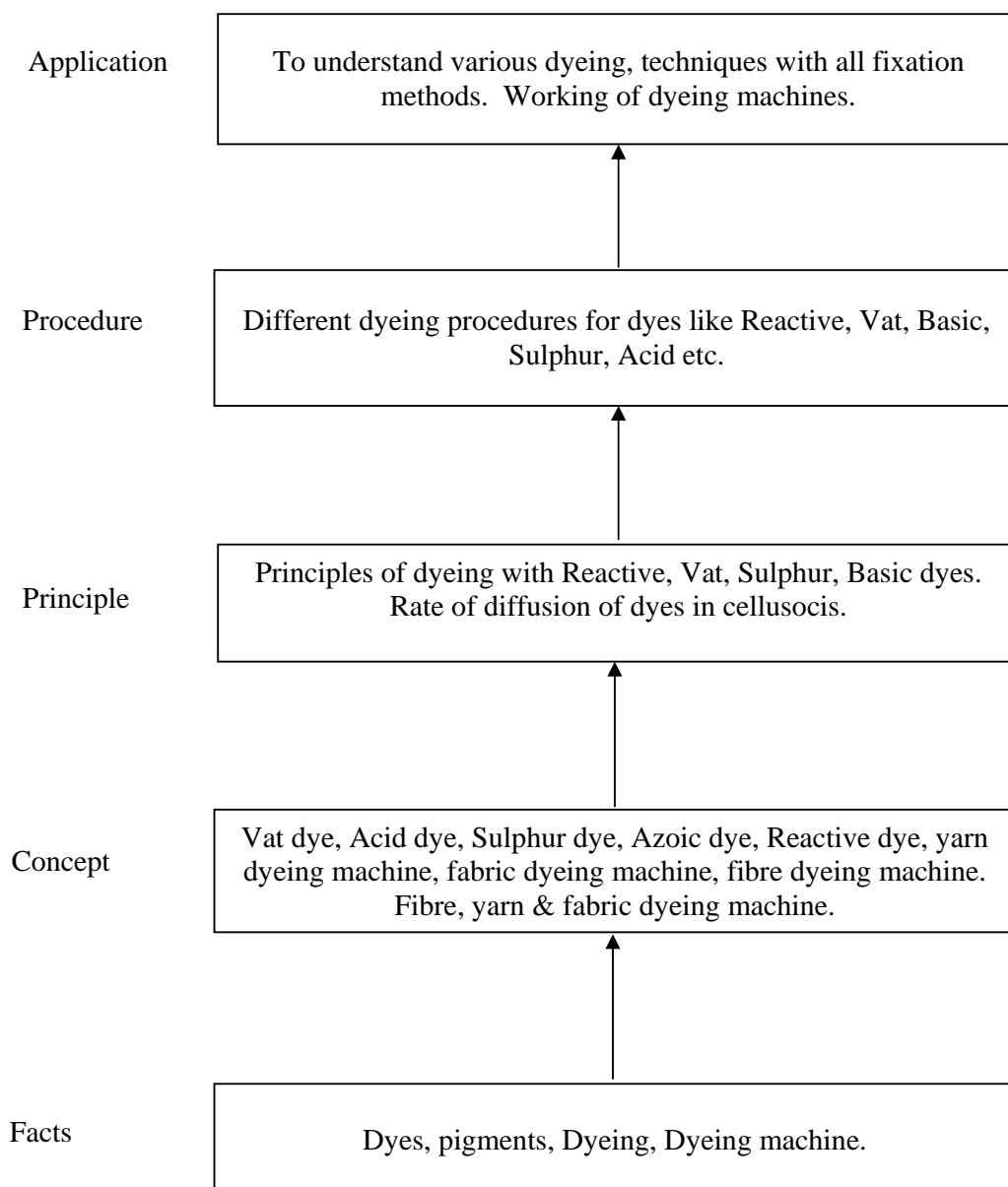
**Rationale:**

The chemical processing of textiles is a value addition process by way of enhancing the aesthetic properties through dyeing and printing. In the second year of this course, the students are taught about the dyeing and printing of textiles with various types of dyes and pigments along with different methods, and styles. The students are also made acquainted with the operations of the machines involved in these processes. In general this subject is devised to impart the knowledge and skills in the areas of dyeing and printing of the textiles.

**General Objectives:**

The students will be able to: -

- Get the basic concepts in dyeing of cellulosic material
- Know the technology of dyeing of cellulosic material with various classes of dyes. Differentiate the various dyeing techniques and their advantages and disadvantages.
- Understand construction and working of various dyeing machines used for cellulosic dyeing.

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Details</b>	<b>Hours</b>	<b>Marks</b>
01	<p><b>Introduction to Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To understand basic concept of dyeing</li> <li>Learn terminologies used in dyeing</li> <li>To understand effect of pretreatments on dyeing</li> </ul> <p>Contents: Definition of - Affinity, Substantivity, Exhaustion, Material to Liquor Ratio (MLR), Percentage shade, Percentage expression. Dyeing Agents – Sequestering agents, Exhausting agents, Dispersing agents, Levelling agents, Retarding agents Mechanism of Dyeing – Adsorption, Absorption, Fixation</p>	07	12
02	<p><b>Direct Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To understand chemical properties and classification of direct dyes</li> <li>To study dyeing procedure</li> <li>To analyze faults and remedies</li> </ul> <p>Contents: Direct Dyes: Properties, Classification, Mechanism, Effect of - electrolytes, temperature, liquor ratio Application on –cellulose and protein fibres After-treatments with – Metallic salts, chromium compounds, formaldehyde, cationic dye fixing agents, basic dyes (topping), diazotization and development Fastness properties Faults and remedies</p>	05	08
03	<p><b>Reactive Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To learn chemical properties and classification of reactive dyes</li> <li>To understand dyeing procedure</li> <li>To analyze faults and remedies</li> </ul> <p>Contents: Reactive Dyes - Properties, Classification Chemical reaction, Effect of dyeing parameters Methods of dyeing with cold brand, hot brand, high-exhaust brand, ME brand, VS brand dyes Dyeing techniques – Exhaust, Pad-batch, Continuous After treatments, Faults and remedies Reactive dyes on silk, wool Fastness properties</p>	08	12

04	<p><b>Vat Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To learn chemical properties and classification of vat dyes</li> <li>To understand dyeing procedure</li> <li>To analyze faults and remedies</li> </ul> <p>Contents: Vat Dyes - Properties, Classification Application steps – vatting, dyeing, oxidation, after treatment Methods – Leuco-vat dyeing (exhaust, padding), Pigmentation, vat acid Fastness properties Faults and remedies</p>	08	12
05	<p><b>Solubalised Vat Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To learn chemical properties and classification of Solubilised vat dyes</li> <li>To understand dyeing procedure</li> <li>To analyze faults and remedies</li> </ul> <p><b>Contents:</b> Properties Steps involved in dyeing Dyeing method Fastness properties Faults and remedies</p>	04	06
06	<p><b>Sulphur Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To learn chemical properties and classification of sulphur dyes</li> <li>To understand dyeing procedure</li> <li>To analyze faults and remedies</li> </ul> <p>Contents: Sulphur Dyes - Properties, Classification Application steps – Reduction, dyeing, oxidation, after treatment Fastness properties Faults and remedies</p>	07	10
07	<p><b>Azoic Dyeing</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>To learn chemical properties and mechanism of azoic colour formation</li> <li>To understand dyeing procedure</li> <li>To analyze faults and remedies</li> </ul> <p>Contents: Properties Naphtholation, Diazotisation, Coupling Shop floor method of application on cotton After treatments Fastness properties Faults and remedies</p>	05	08

08	<p><b>Dyeing with Basic Dyes</b>          Specific Objectives:</p> <ul style="list-style-type: none"> <li>• To learn chemical properties and classification of Basic dyes</li> <li>• To understand dyeing procedure</li> <li>• To analyze faults and remedies</li> </ul> <p>Contents:          Properties          Mechanism of dyeing on – cellulosic fibres, protein fibres          Dyeing of silk fibre          Dyeing of wool fibre          Dyeing of cellulosic fibres          After treatments          Fastness properties</p>	04	06
09	<p><b>Dyeing With Acid Dyes</b>          Specific Objectives:</p> <ul style="list-style-type: none"> <li>• To learn chemical properties and classification of Acid dyes</li> <li>• To understand dyeing procedure</li> <li>• To analyze faults and remedies</li> </ul> <p>Contents:          Acid dyes – Properties, Classification          Dyeing mechanism of protein fibres          Dyeing of silk fibre          Dyeing of wool fibre          After treatments          Fastness properties</p> <p><b>Dyeing With Metal Complex Dyes</b>          Metal Complex dyes - Properties, Classification          Dyeing mechanism of protein fibres          Dyeing of wool fibre          After treatments          Fastness properties</p>	04	08
10	<p><b>Dyeing With Natural Dyes</b>          Specific Objectives:</p> <ul style="list-style-type: none"> <li>• To learn sources of natural dyes</li> <li>• To understand dyeing procedure</li> <li>• To analyze faults and remedies</li> </ul> <p>Contents:          Classification of natural dyes          Properties          Application on cellulosic material          Faults and remedies</p>	04	06

11	<p><b>Dyeing Machines</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>• To understand types of dyeing machines</li> <li>• To learn construction and working of m/cs</li> <li>• To compare advantages and limitations of different m/cs</li> </ul> <p>Contents: Construction , working , advantages and disadvantages of:</p> <ul style="list-style-type: none"> <li>• Fibre/Yarn Dyeing Machine - Hank Dyeing, Package Dyeing</li> <li>• Jigger Dyeing Machine</li> <li>• Winch Dyeing Machine</li> <li>• Semi continuous and Continuous Dyeing Machines</li> </ul>	08	12
<b>Total</b>		<b>64</b>	<b>100</b>

**Practicals:**

Skills to be developed

**Intellectual Skills:**

The student will learn

- 1) Understand dying process.
- 2) Learn after treatments.
- 3) Learn dyeing machine.

**Motor Skill:**

The student will learn

- 1) Dyeing if cellulosic & protein fibre with different dyes.
- 2) To operate dyeing machine.

**List of Experiments:**

1. Dyeing of cotton with direct dye
2. After treatment with direct dyed goods
3. Dyeing of cotton with hot brand & HE brand reactive dyes
4. Dyeing of cotton with ME & ramazol reactive dyes
5. Dyeing of cotton with vat dyes
6. Dyeing of cotton with sulphur dye
7. After treatments of sulphur dyed goods
8. Dyeing of cotton with azoic colours
9. Dyeing of wool & silk with basic dye
10. Dyeing of wool & silk with acid dye
11. Dyeing of wool & with metal complex dye
12. Dyeing of cotton fabric with reactive dyes by semi-continuous dyeing method.
13. Dyeing of cotton fabric with reactive dyes by continuous dyeing method.

**Implementation Strategies:**

The teaching learning will involve many methods such as: Class room lectures with questions and answers, mill visits, discussions, exercises, practices assignments etc. The classroom & practice sessions will be enriched by industry-based materials in the form of photographs, slides, transparencies, video programs and computer based programs.

**References:**

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1	Dr. C. V. Koushik & Mr. Antao Irwin Josico	Chemical Processing of Textiles	1 <sup>st</sup>	2003	NCUTE, 8 <sup>th</sup> Floor, Main Building, IIT, Hauz Khas, New Delhi-110016
2	V. A. Shenai	Technology of Dyeing	2 <sup>nd</sup>	2000	Sevak Publications Mumbai - 400031
3	T. L. Vigo	Textile processing & properties	2 <sup>nd</sup>	1994	Elsevier Science B.V. Amsterdam
4	Clifford Pireston	The dyeing of cellulose fibres	1 <sup>st</sup>	--	Dyers co. Publication Trust. England.
5	F. Sadav	Chemical technology of fibres materials	1 <sup>st</sup>	1973	Mir Publication Miscrow
6	M. L. Gulrajani	Silk dyeing printing & finishing	3 <sup>rd</sup>	1988	I.I.T. Delhi Dept.

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Technology of Printing-I**

**Subject Code : 17468**

**Teaching & Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
04	--	03	03	100	50#	--	25@	175

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

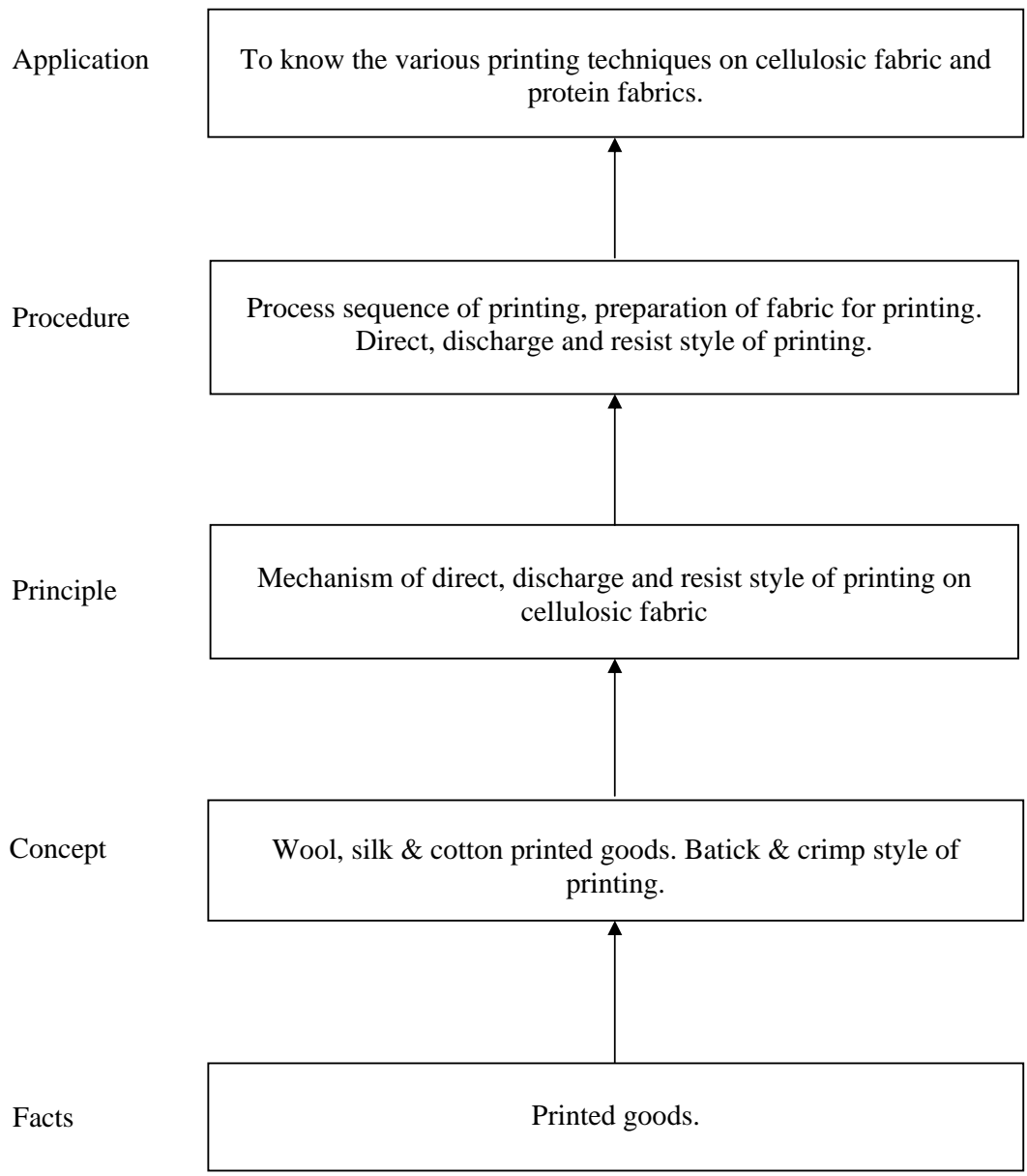
The chemical processing of textile is a value addition process by way of exhausting the aesthetic properties through printing and other processes. The students will be acquainted with the operation of printing. In general this subject will impact knowledge and skills in the areas of printing of textile fabrics.

**Objectives:**

The students will be able to:

- Get the basic concepts in printing of fabrics.
- Know the technology of printing, different techniques of printing, their advantages and disadvantages.
- Understand construction and working of various printing machines.

**Learning Structure:**



## CONTENTS: Theory

Chapter	Name of the Topic	Hours	Marks
1	<p><b>Introduction to Textile Printing</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ Importance of pretreatments for fabric printing</li> <li>➤ Various ingredients and their role in printing</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Preparation of cotton fabric for printing</li> <li>• Print paste ingredients and their functions</li> <li>• Classification of thickeners, chemistry of thickeners</li> <li>• Advantages and limitations of thickeners.</li> <li>• <b>Selection criteria of thickeners for various dyes</b></li> </ul>	10	16
2	<p><b>Methods of printing and styles of printing:</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ Various methods of printing</li> <li>➤ Various styles of printing</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• General classification of methods of printing</li> <li>• Tie and dye method, batik printing, stencil printing and block printing.</li> <li>• Classification of styles of printing</li> <li>• Principles of direct ,discharge, resist styles of printing</li> </ul>	10	12
3	<p><b>Printing machinery</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ Working of machineries for printing</li> <li>➤ Advantages and limitations of every machinery</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Table printing – Technical features, faults , causes and remedies.</li> <li>• Flat-bed printing- technical features, types of squeezes, advantages and limitations.</li> <li>• Screen preparation for flat bed printing machine.</li> <li>• Rotary screen printing-technical features, types of squeezes, advantages and limitations</li> <li>• Screen exposing for rotary printing machine.</li> </ul>	14	24
4	<p><b>Printing of Cotton:</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ Fixation mechanism of prints</li> <li>➤ Print paste formulation for direct, reactive and azoic colours.</li> </ul> <p><b>Contents:</b></p> <p>4.1 Print fixation methods <b>8 Marks</b></p> <ul style="list-style-type: none"> <li>• Methods of print fixation</li> <li>• Mechanism of print fixation during steaming</li> <li>• Steaming machineries- Star ager and rapid ager</li> </ul> <p>4.2 Formulation of print paste <b>16 Marks</b></p>	20	30



	<ul style="list-style-type: none"> <li>• Printing with direct dye – Print paste formulation for direct style of printing and discharge style of printing.</li> <li>• Printing with reactive dye - Print paste formulation for direct style of printing, discharge style of printing and resist style of printing.</li> <li>• Printing with azoic colours: Print paste formulation for direct style of printing.</li> </ul> <p>4.3 Special print effects <b>6 Marks</b></p> <ul style="list-style-type: none"> <li>• Khadi printing</li> <li>• Magic and Crimp styles of printing on cotton</li> </ul>		
5	<p><b>Printing with pigment on Cotton:</b></p> <ul style="list-style-type: none"> <li>• Principle of pigment printing,</li> <li>• Print paste ingredients,</li> <li>• Print paste formulation for pigment printing and process sequence.</li> </ul>	04	10
6	<p><b>Printing of Wool and Silk:</b></p> <ul style="list-style-type: none"> <li>• Preparation of fabrics for printing,</li> <li>• Print paste formulation for direct style of printing on wool and silk fabric using acid, metal complex and basic dyes with process sequence.</li> </ul>	06	08
<b>Total</b>		<b>64</b>	<b>100</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

- 1) Understand screen preparation.
- 2) Understand printing process.
- 3) Learn different styles of printing.

**Motor Skill:**

- 1) Drawing a design & prepare screen of same.
- 2) Direct, discharge & resist style of printing.

**List of Practicals:**

- 1) Preparation of screen for printing.
- 2) Develop Tie & dye effect on cotton fabric.
- 3) Develop batik effect on cotton fabric.
- 4) Application of direct dye on cotton by direct style of printing.
- 5) Application of reactive dye on cotton by direct style of printing.
- 6) Application of azoic colour on cotton by direct style of printing.
- 7) Develop magic style of printing, crimp style of printing effects on cotton.
- 8) Obtain White & colour discharge effects on cotton using direct and reactive dyes.

- 9) Obtain azoic colour discharge effect on direct dyed ground.
- 10) Obtain White & colour resist effect on reactive dyed ground.
- 11) Printing of Silk using acid dyes.

**Learning Resources:****Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Edition</b>	<b>Year of Publication</b>	<b>Publisher</b>
1	Prof. N.L. Gulrajani	Silk Dyeing, Printing & Finishing	2 <sup>nd</sup>	1988	Dept. Of Textile Technology, IIT Delhi
2	Dr. K.V. Datye & A.A. Vaidya	Chemical Processing Of Synthetic And Its Blends	2 <sup>nd</sup>	1984	A Wiley Inter Science Publication
3	L.W. C. Miles	Textile Printing	2 <sup>nd</sup>	1981	The Dyer Company Publication Trust
4	Dr. V. A. Shenai	Technology. Of Printing, Vol. IV	3 <sup>rd</sup>	1990	Sevak Publication

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Technology of Finishing-I**

**Subject Code : 17469**

**Teaching & Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	03	03	100	--	25#	25@	150

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

The word textile finishing defines a series of processing operations applied to grey fabrics to enhance their appearance and hand, properties and possible applications. The term functional finishing with reference to all the mechanical or chemical finishing operations carried out on fabrics already bleached, dyed or printed to further enhance their properties and possibly add some new ones.

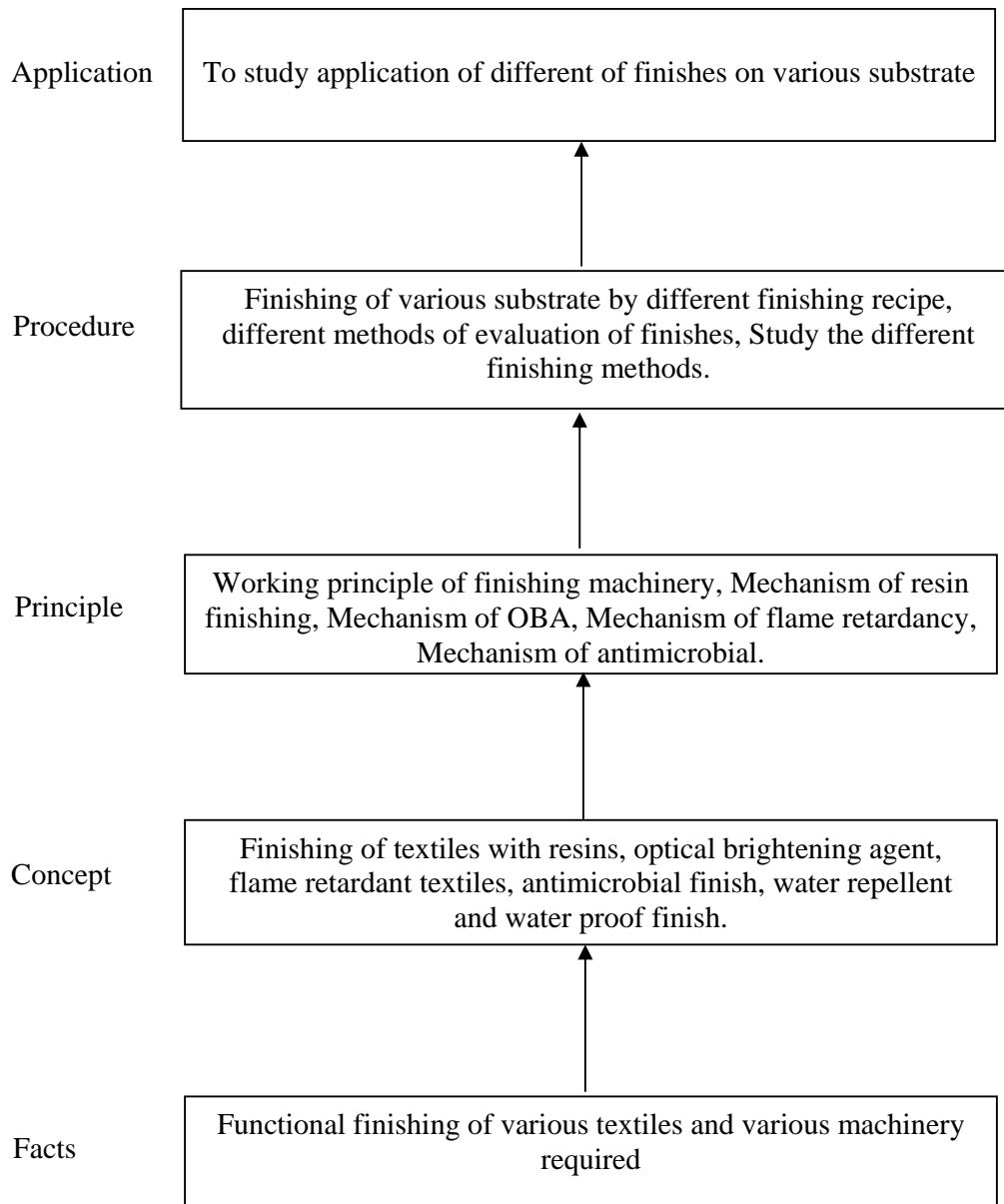
The terms finishing and functional finishing are therefore similar and both play a fundamental role for the commercial excellency of the results of textiles, strictly depending on market requirements that are becoming increasingly stringent and unpredictable and permit very short response times.

**Objectives:**

The students will be able to: -

- Know the basic concepts and types of finishing
- Have the knowledge of various formulations of different functional finishes.
- Study the functional finishes.

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<p><b>Introduction to Finishing and application techniques</b>  <b>Objects of finishing, classification of finishing,</b>            Application techniques-</p> <ul style="list-style-type: none"> <li>• Review of exhaust method of application</li> <li>• Padding - Concept of percentage expression, weight pick-up, and operation</li> </ul> <p>Working principle of machinery like Calendaring, Sueding, Sanforising, Stenter.</p>	08	20
02	<p><b>Softeners &amp; Stiffeners</b>            Classification of softener, Properties, mode of action and application of Cationic, Anionic, Non-ionic, Reactive and Emulsion softeners. Softeners for cotton, wool, silk, polyester. Classification of stiffeners, examples and their application.</p>	08	16
03	<p><b>Resin Finishing</b>            Object of resin finishing, Mechanism of creasing and resin finishing, General recipe for Resin finishing, Role of catalyst in resin finishing, Concept of anticrease, wash-n-wear and Durable Press. Classification and properties of resin and catalysts. Concept of pre- cure and post cure method. Durable press finishing for denim garments, Limitations of resin finishing. Concept of eco-friendly cross linking agents. Evaluation methods like crease recovery angle and DP rating.</p>	10	20
04	<p><b>Optical Brightening Agent Finishing</b>            Chemistry, mechanism and application methods of OBA for cotton, wool, silk, polyester. Stripping of OBA.</p>	04	08
05	<p><b>Flame Retardancy</b>            Burning cycle and thermal behaviour of textile fibres. Concept of flame proof and flame retardancy. Limiting oxygen Index and its importance, Classification of flame retardants. Mechanism of Solid Phase and Gas Phase flame retardant. Factors affecting flame retardancy. Essential requirements of a good flame retardant. Various flame retardants for Cotton, Wool, Silk, Polyester and Nylon. Evaluation of flame retardancy by angular test method.</p>	06	16
06	<p><b>Antimicrobial Finishing</b>            Objects, requirements, types and mechanism of antimicrobial finishing. Desirable properties of a good antimicrobial finish, Various antimicrobial finishes for Cotton, Wool, and Silk. Moth proofing of wool, Evaluation of antimicrobial finishes.</p>	06	10
07	<p><b>Introduction to Special Finishes</b>            Waterproof and water repellent finishing, Biopolishing, Scroopy finish for silk, Concept of Nano-finishes.</p>	06	10
<b>Total</b>		<b>48</b>	<b>100</b>

**List of Experiments:**

1. Preparation and application of Blue Tone and Red Tone on cellulosic.
2. Application & evaluation of various types of softeners on cotton.
3. Finishing of cotton for imparting soft, medium and stiff handle.
4. Resin finishing of cotton.
5. Application of OBA on Cotton by continuous & exhaust method.
6. Finishing of wool to impart moth proofing.
7. Finishing of Silk to improve softness and crease recovery property.
8. Application & evaluation of anti microbial finish on cotton.
9. Application & evaluation of flame retardant finishing on cotton.
10. Application & evaluation of waterproof / Water repellent Finishing on cotton.

**Learning Resources:****Books:**

Sr. No.	Author	Title	Edition	Year of Publication	Address of Publisher
1	Dr. K.V. Datye & A.A. Vaidya	Chemical Processing of Synthetic and Its Blends	2 <sup>nd</sup>	1984	A Wiley Inter science Publication
2	Dr. A. V. Shenai	Tech. of Finishing Vol. X	3 <sup>rd</sup>	1990	Sevak Publication
3	J.T. Marsh	Introduction To Textile Finishing	2 <sup>nd</sup>	1979	B.I. Publication
4	Marks, Atlas & Wooding	Chemical After Treatments of Textiles.	4 <sup>th</sup>	1971	Wiley Inter science
5	R.M. Mittal & S. S Trivedi	Chemical Processing of Polyester & Cellulosic Blends	3 <sup>rd</sup>	1984	ATIRA, Ahemadabad
6	R. S. Bhagwat	Handbook of Textile Finishing Machinery	--	--	--
7	ACMIT	Finishing, Reference Book of Textile Technologies	--	--	--
8	Heywood	Textile Finishing	--	--	SDC Publications

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Elements of Chemical Engineering Operation**

**Subject Code : 17470**

### Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	--	100

#### NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW).

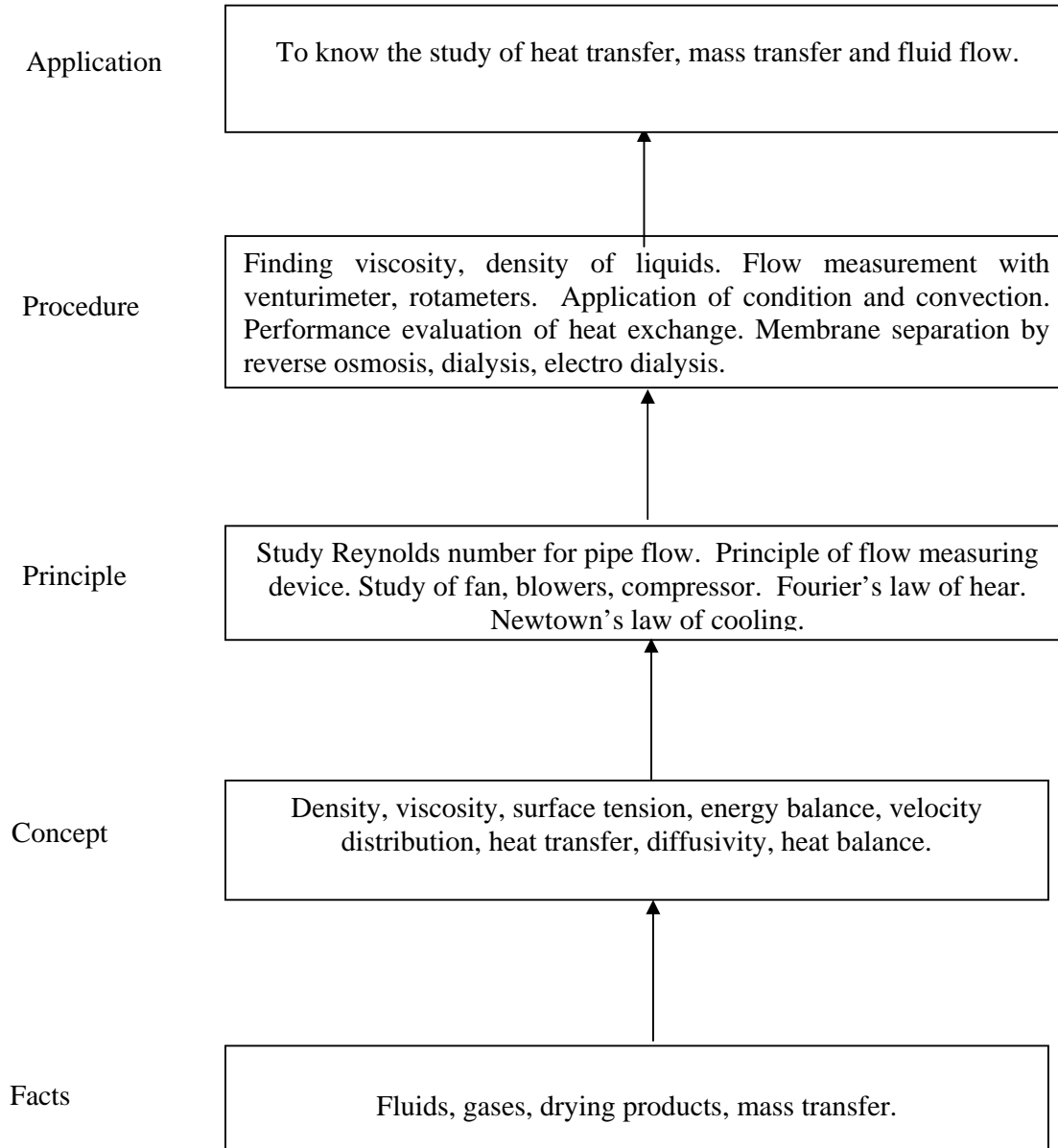
#### Rational:

This subject intends to provide a self-contained introduction and back ground of cognate topics of fluid or momentum transfer, heat transfer, and mass transfer. The chemical processing of textile is very diverse in nature and involves the transfer of the fluid material from one place to other for its use in the machines. The technologists in this industry should have the basic understanding of the principles of fluid flow, heat transfer and mass transfer in order to control the process by operating it to an optimum level.

#### Objectives:

The student will be able to:

- Learn basics of the unit operations of Chemical Engineering.
- Understand the importance of the subject to textile industry.
- Apply the knowledge of the subject to textile industry practices.

**Learning Structure:**



## CONTENTS: Theory

Chapter	Name of the Topic	Hours	Marks
01	<b>Unit Systems And Introduction to Fluid Flow</b> <b>Specific Objectives: Student will be able to understand</b> <ul style="list-style-type: none"> <li>➤ <b>Different unit systems and conversions</b></li> <li>➤ <b>Properties of fluids &amp; their variations</b></li> </ul> <ul style="list-style-type: none"> <li>• Review of various unit systems.</li> <li>• Study of units and conversions of some of the important physical quantities.</li> <li>• Introduction &amp; importance of fluid flow studies to textiles.</li> <li>• Definition of fluid, study of fluid properties like density, viscosity, statement of Newton's Law of Viscosity ,</li> <li>• Definition of compressible, incompressible, real &amp; ideal fluids.</li> <li>• Study of rheology of Non Newtonian fluids.</li> </ul>	07	12
02	<b>Study of Fluids In Motion</b> <b>Specific Objectives: Student will be able to understand</b> <ul style="list-style-type: none"> <li>➤ <b>Various flow equations &amp; their significance</b></li> <li>➤ <b>Material &amp; energy balances</b></li> </ul> <ul style="list-style-type: none"> <li>• Reynolds Experiment for fluid flow through pipes.</li> <li>• Equation of continuity and Bernoulli's Equation (Only expressions no derivation) with the significance of the equations.</li> <li>• Concept of energy losses &amp; friction factor (no derivations &amp; no numerical)</li> <li>• Pipe Fittings: Types &amp; Purpose</li> </ul>	05	12
03	<b>Transportation of Fluids And Measurements of Fluid Flow:</b> <b>Specific Objectives: Student will be able to</b> <ul style="list-style-type: none"> <li>➤ <b>Understand working of machineries required for fluid transfer</b></li> <li>➤ <b>Measure &amp; control the flow rates</b></li> </ul> <ul style="list-style-type: none"> <li>• Need for pumping of liquids,</li> <li>• Principle, construction &amp; working of centrifugal pump..</li> <li>• Importance of fluid flow measurement in textile.</li> <li>• classification of flow measuring devices:</li> <li>• Construction, principle, and working of venturi meter, orifice meter.</li> </ul>	05	14
04	<b>Introduction to Heat Transfer</b> <b>Specific Objectives: Student will be able to understand</b> <ul style="list-style-type: none"> <li>➤ <b>Concepts of heat transfer</b></li> <li>➤ <b>Application of conduction</b></li> </ul> <ul style="list-style-type: none"> <li>• Definition of heat transfer operation.</li> <li>• Study of modes of heat transfer.</li> <li>• Definition of terminologies like specific heat, heat capacity,</li> <li>• Latent heat, sensible heat, thermal conductivity, and thermal diffusivity, heat as a form energy, heat transfer rate and heat transfer co-efficient.</li> <li>• Energy conservation in textiles</li> </ul>	08	14

	<ul style="list-style-type: none"> <li>• Conduction heat transfer: Fourier's law of heat conduction,</li> <li>• Study of heat flow through a thick slab, thick cylindrical pipe.</li> <li>• Study of thermal insulations.</li> <li>• Applications of conduction heat transfer in textile industry.</li> </ul>		
05	<p><b>Convection &amp; Radiation heat transfer</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ <b>Concept of convection &amp; radiation</b></li> <li>➤ <b>Applications of above from textile point of view</b></li> </ul> <ul style="list-style-type: none"> <li>• Statement of Newton's Law of cooling,</li> <li>• concept of heat transfer coefficient,</li> <li>• Study of free &amp; forced convection.</li> <li>• Applications of convection heat transfer to textile industry.</li> <li>• Concept of heat transfer by radiation,</li> <li>• concept of black body radiation,</li> <li>• statement of basic laws of radiation</li> <li>• Applications</li> </ul>	05	14
06	<p><b>Introduction to Mass Transfer Operation</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ <b>Unit operations</b></li> <li>➤ <b>Control of mass transfer, avoid wastage, conservation of mass</b></li> </ul> <ul style="list-style-type: none"> <li>• Concept of mass transfer operation &amp; diffusion.</li> <li>• Definition of diffusion co-efficient, mass transfer rate.</li> <li>• Study of modes of mass transfer viz. molecular diffusion and eddy diffusion.</li> <li>• Classification of mass transfer operations.</li> <li>• Definition and applications of distillation, extraction, absorption, adsorption, crystallization, evaporation.</li> </ul>	05	10
07	<p><b>Simultaneous heat &amp; Mass transfer operations</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ <b>About drying &amp; its need</b></li> <li>➤ <b>Working of driers</b></li> </ul> <ul style="list-style-type: none"> <li>• Introduction to drying as a unit operation.</li> <li>• Applications of drying techniques in general &amp; particularly to textile industry</li> <li>• Study of diffusion and capillary theory of drying. Brief</li> <li>• study of textile dryers :tumble drier, stenter</li> <li>• Introduction to humidification operation. Importance of humidification in textile mills.</li> <li>• Definitions of the terms like dry bulb and wet bulb tempratures, dew point , humidity, percent humidity, absolute and relative humidity,</li> </ul>	09	14
08	<p><b>Filtration and Membrane Separation Techniques</b>  <b>Specific Objectives: Student will be able to understand</b></p> <ul style="list-style-type: none"> <li>➤ <b>Filteration &amp; its application in textile industry</b></li> <li>➤ <b>advance techniques for effluent treatment</b></li> </ul> <ul style="list-style-type: none"> <li>• Introduction to filtration operation, filter aids, filter media,</li> </ul>	04	10

	<ul style="list-style-type: none"> <li>• Applications of filtration to textile industry.</li> <li>• Introduction to membrane separation Techniques.</li> <li>• Advantages of membrane technology &amp; applications of these techniques in general &amp; in particular to textile industry.</li> <li>• Study of micro, ultra filtration, reverse osmosis.</li> </ul>		
<b>Total</b>		<b>48</b>	<b>100</b>

**Learning Resources:****Books:**

<b>Sr. No</b>	<b>Author</b>	<b>Title</b>	<b>Edition</b>	<b>Year of Publication</b>	<b>Address of Publisher</b>
01	Badger & Banchero	Introduction to Chemical Engineering	2 <sup>nd</sup>	1991	McGraw Hill Publication
02	Treybal	Mass Transfer	5 <sup>th</sup>	1985	McGraw Hill Publication
03	Coulson & Richardson	Chemical Engineering	Vol 1-5	1991	McGraw Hill Publication

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Textile Testing**

**Subject Code : 17471**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

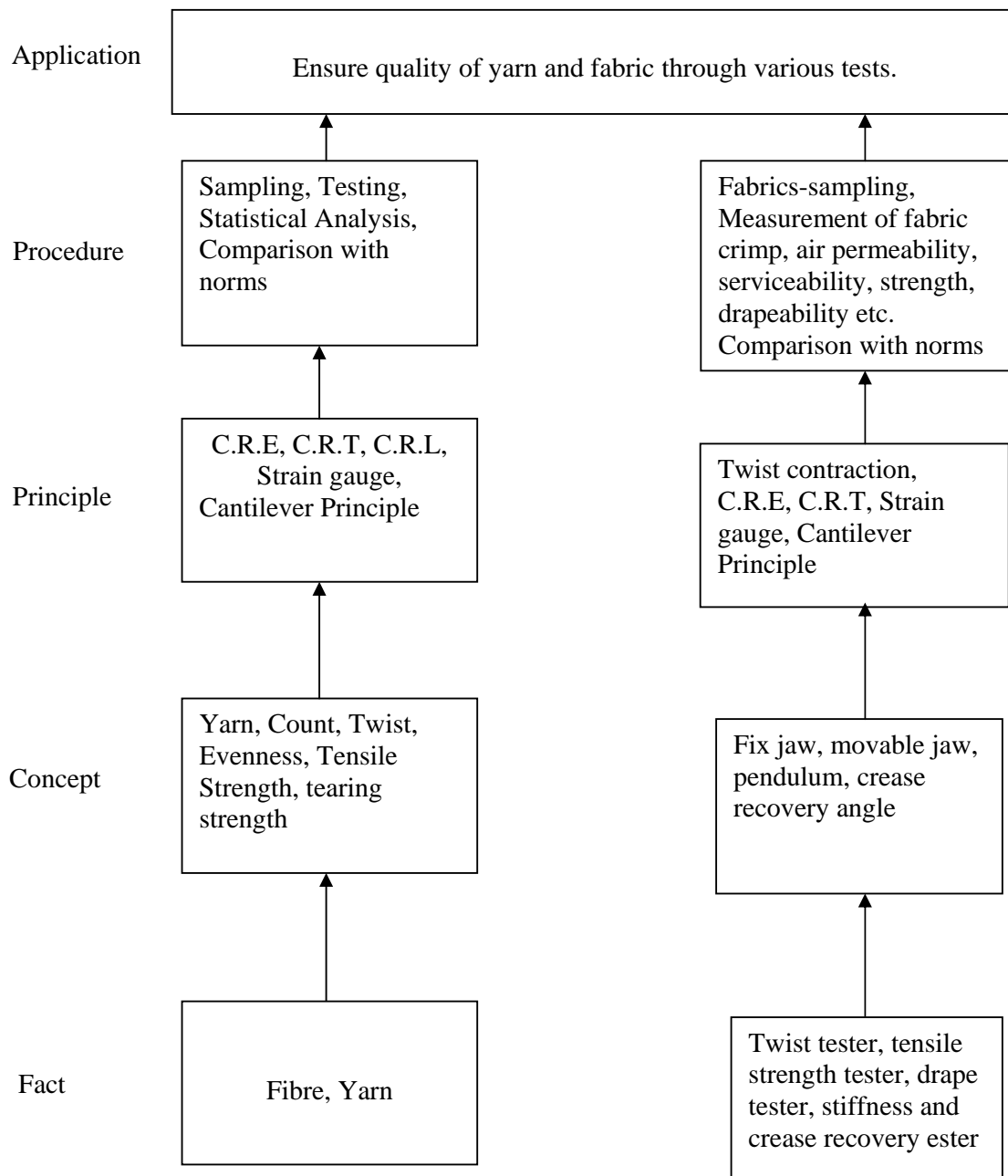
Variety of raw materials for textile manufacturing are used, such as cotton, silk, synthetic fibers, etc. These raw materials are being used individually or mixed in different proportions to form a yarn of desired quality. The raw materials can be tested for numerous characteristics like fiber length, fineness, strength, maturity etc. Intermediate products like sliver, roving etc. are also required to be tested for controlling the process, for optimizing the process parameters or for developing existing process. Finally, to ensure the quality product, final product that may be yarn, fabric or garment, testing is imperative. This subject intends to equip students with the concepts, principles and methods of testing of various textile fiber, yarns and fabric, which is helpful in selection of raw materials, process control, process optimization, quality assurance and research purpose.

Since textile is system of mass production and contains lots of variations, lot of experimentation is required. Results obtained from specific number of observations are to be analyzed, interpreted and used for best outcomes. Therefore, students are equipped with the methods to analyze the testing results statistically.

**General objectives:**

1. Understand principle & concept of Testing of Yarns / Fabric
2. Measure Count, Twist, Evenness and Strength of yarn.
3. Measure strength, cover factor, air permeability of fabric.
3. List standard methods used for testing textile material.
4. Define various terms used in yarn & fabric testing.
5. Correlate the result of the tests to the application of material.

**Learning Structure:**



**Detailed Contents:**

Chapter	Contents	Hours	Marks
1	<b>YARN TESTING:</b> <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Select yarn count measuring system.</li> <li>➤ Describe the process testing of yarn twist.</li> <li>➤ List different methods of twist measurement.</li> <li>➤ Interpretation of effects of twist on fabric properties</li> <li>➤ Know effects of unevenness.</li> </ul> <b>1.1 Yarn Count:</b> <ul style="list-style-type: none"> <li>• Different systems of yarn numbering.(direct, indirect)</li> <li>• Definition : British count, Metric, Tex, Denier count</li> <li>• Standard method of determination of yarn count with electronic balance</li> </ul> <b>1.2 Yarn Twist:</b> Definition, direction twist, effect of twist on yarn and fabric properties. Measurement of yarn twist - <ul style="list-style-type: none"> <li>• Twist Contraction principle</li> <li>• Twist and Untwisting principle</li> </ul>	10	16
	<b>1.3 Yarn evenness:</b> Concept, Types of variations in yarn (random& periodic), Expressions used for unevenness: U%, C.V. %, Imperfections. Effect of yarn unevenness on yarn & fabric properties.	06	08
2	<b>FABRIC TESTING:</b> <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Know different fabric properties to be tested.</li> <li>➤ List importance of fabric testing.</li> <li>➤ Interpretation of test results.</li> <li>➤ Selection of Testing Methods as per End use.</li> </ul> <b>2.1 Fabric sampling method</b>  <b>2.2 Fabric dimensional Properties:</b> Fabric Length, Width, Thickness, Weight measurement. Warp Count, Weft Count, and Threads/Unit length, Cover factor (only formula), Crimp in Warp and weft.	06	16
	<b>2.3 Stiffness &amp; Drape of fabric:</b> Measurement of drape &stiffness. <b>2.4 Crease Recovery</b> Measurement by crease recovery angle	04	14
	<b>2.5 Serviceability of fabric</b> Definition: serviceability, wear, and abrasion. Measurement of wear: Martindales Abrasion tester. Pilling of fabric: factors responsible for pilling of fabric. Measurement of pilling ICI Pill box tester.	06	12

	<p><b>2.6 Water and Air relation to fabric</b>  Definitions : Waterproof, shower proof fabrics, water Repellent fabrics.  Measurement:  <ul style="list-style-type: none"> <li>• Spray test,</li> <li>• Hydrostatic water head test.</li> </ul> Definition : Air-permeability, Air resistance, Porosity  Measurements of air permeability, Factors affecting air-permeability.</p>	08	12
3	<p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Describe the process of tensile strength testing of yarn and fabric</li> <li>➤ Describe the process of tearing strength, Bursting strength testing of and fabric.</li> <li>➤ Use appropriate method of testing of tensile, tearing strength.</li> </ul> <p><b>3.1 Tensile Strength Testing:</b>  Definitions: load, elongation, Mass Stress, tenacity, work of rupture, work factor, elastic recovery.</p> <p><b>3.2 Yarn Strength:</b> Measurement of single yarn strength &amp; lea strength. Count Strength Product (CSP)</p>	04	10
	<p><b>3.3 Fabric strength Testing:</b>  Sample size, principle, working of testers for Fabric tensile strength, tearing strength, Bursting strength.</p>	04	12
	<b>Total</b>	<b>48</b>	<b>100</b>

### Skills to be developed

#### 1) Intellectual Skills:

1. Proper selection of measuring instruments depending upon the data and precision required.
2. Analyze properties of matter & their use for the selection of material.
3. To interpret the results from observations and calculations.
4. To use these results for corrective actions in mechanical and wet processing.

#### 2) Motor Skills:

1. Proper handling of instruments.
2. Measuring physical properties of yarn and fabric accurately.
3. To observe the phenomenon and to list the observations in proper tabular form.
4. To adopt proper procedure while performing the experiment.

**Practical:****Skills to be developed:****List of Practical:**

1. Determination of yarn count.
2. Determination of twist in single and doubled yarn.
3. Determination of breaking load and elongation of yarn.
4. Determination of lea strength & count strength product (CSP) of cotton yarn
5. Determination of tensile strength of fabric.
6. Determination tearing strength of fabric.
7. Determination of fabric stiffness.
8. Determination of drape of fabric.
9. Assessment of abrasion resistance and pilling propensity of fabric.

**References:****Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1	Angappan	Textile Testing	SS Textile Inst, Coimbatore
2	J. E. Booth	Principles of Textile Testing	--
3	Kothari	Testing and Quality Management	IAFL, New Delhi
4	B. P. Saville	Physical Testing of Textiles	--

**Websites:**

- 1) [www.scribd.com](http://www.scribd.com)
- 2) [www.fibre2fashion.com](http://www.fibre2fashion.com)



**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Professional Practices-II**

**Subject Code : 17052**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

**Rationale:**

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts.

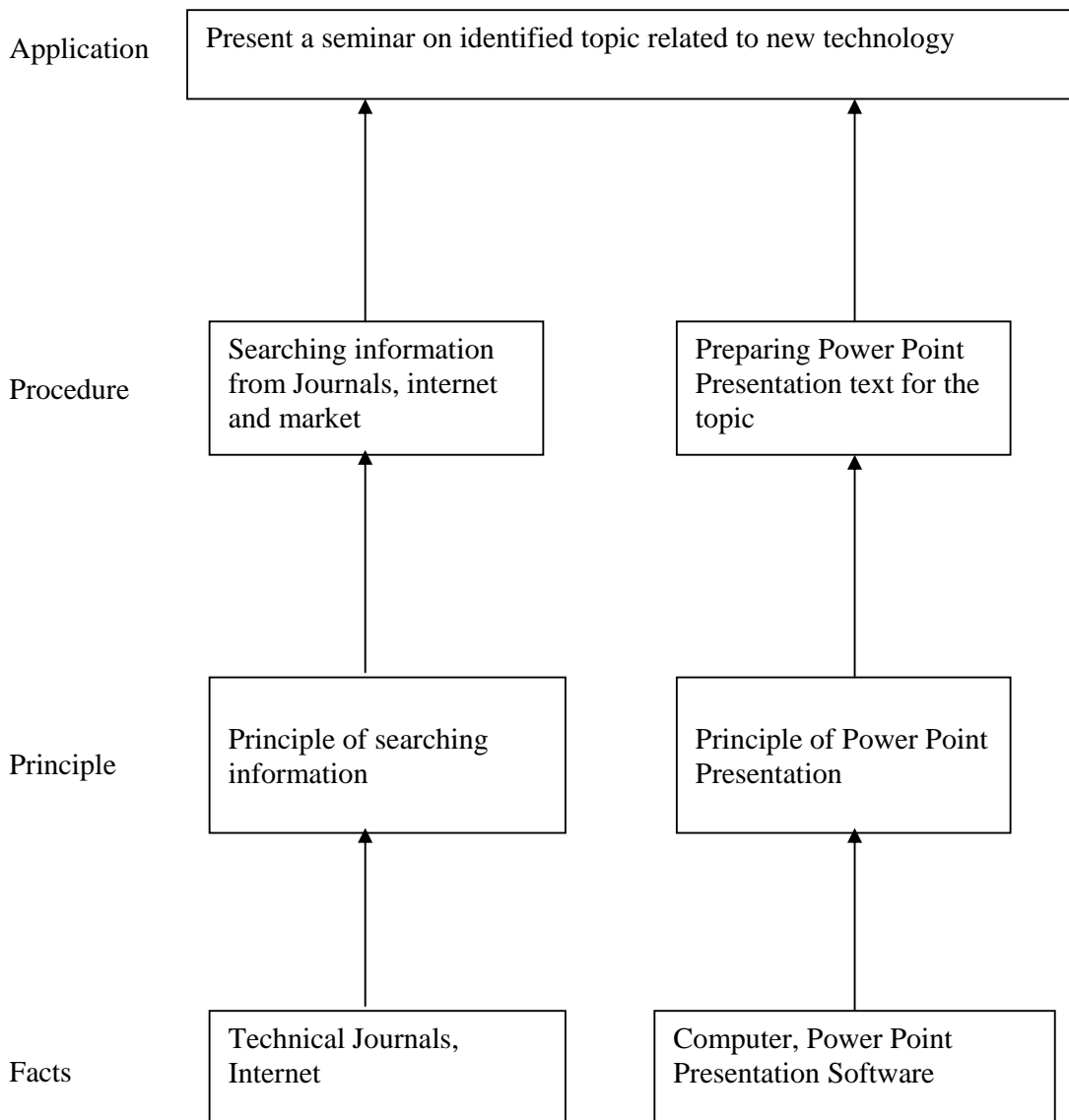
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Objectives:**

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

**Learning Structure:**



Sr. No.	Activities	Hours
1	<p><b>Industrial Visits</b></p> <p>Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.</p> <p>The industrial visits may be arranged in the following areas / industries :</p> <ul style="list-style-type: none"> <li>i) Effluent treatment plant</li> <li>ii) Auxiliary manufacturing unit</li> <li>iii) Research unit.</li> <li>iv) Quality testing unit.</li> <li>v) Machine manufacturing unit</li> <li>vi) Dyeing &amp; Printing Unit</li> </ul>	14
2	<p><b>Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas:</b></p> <ul style="list-style-type: none"> <li>i) Interview Techniques.</li> <li>ii) Energy conservation in textile.</li> <li>iii) Non conventional energy sources.</li> <li>iv) Woven and knit goods continuous processing &amp; machines.</li> <li>v) Nanotechnology.</li> </ul>	06
3	<p><b>Information Search:</b></p> <p><b>Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic.</b></p> <p><b>Following topics are suggested :</b></p> <ul style="list-style-type: none"> <li>i) Advances in chemicals &amp; Auxiliaries.</li> <li>ii) Latest trends in wet processing.</li> <li>iii) Steam consumption &amp; water consumption in processing machine.</li> <li>iv) Right first time technique in processing.</li> <li>v) Maintenance procedure for effluent treatment plant.</li> </ul>	08
4	<p><b>Seminar :</b></p> <p>Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes)</p>	10
5	<p><b>Mini Project / Activities : (any one)</b></p> <ul style="list-style-type: none"> <li>a) Conventional process study of any one machine in dyeing.</li> <li>b) Conventional process study of any one machine in printing.</li> <li>c) Conventional process study of any one machine in bleaching.</li> <li>d) Sketch and working of analytical instrument like spectrophotometer or microscope.</li> <li>e) Literature survey of any one given topic.</li> </ul>	10
<b>Total</b>		<b>48</b>

**Course Name : Diploma in Textile Technology**

**Course Code : TC**

**Semester : Fourth**

**Subject Title : Industrial Training**

**Subject Code : 17053**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
--	--	**	--	--	--	--	--	--

**\*\* Industrial training for six weeks to be completed during summer break after Fourth semester. Assessment to be done in Fifth Semester**

**Objectives:**

- Experience the industrial environment for textile industrial processes, equipment & practices.
- Collect data about Plant lay out, equipment and machines-specifications and working available in different sections and collect data.
- Experience operation of machines and process parameters of spinning and weaving departments for the target production and collect data.
- Appreciate factory utilities – power water illumination men and material movement, pollution control, industrial safety etc.
- Carryout the material testing at different stages of yarn and fabric production for quality.
- Experience maintenance schedules of all the equipment and collect information on the effects of negligence of maintenance.
- Diagnose problems and find solutions to problems related with operation, and maintenance of equipment.
- Study the organization structure, job description, job specifications, promotional schemes, motivational strategies, etc.
- Collect data on production incentives, methods study and time & motion studies.
- Critical study of all activities with a view to find the areas for improvement.
- Devise solution to problem areas.
- Collect information / data for project work and seminars.

However, the detailed list of areas of study, working and data collection has been prepared and is enclosed in **3.5 – Specific area of study and working**. The student should regularly refer to this list and accordingly choose the areas and acquire the knowledge information and skills.

### 3.2 General Guidelines

- The students have to undergo industrial training in chemical processing departments of fabric / yarn / garment for 6 weeks in between fourth and fifth semesters.
- The student has to maintain a daily diary, in which they will record the daily achievements, which should be countersigned by the industry officer.
- The student should carry out the critical study of different activities and try to locate the problem or problems in any of the areas of product quality, productivity, efficiency, cost control and cost reduction, etc. Then, he should try to devise solutions to such problem.
- After completion of training each student has to bring the certificate for the entire duration for satisfactory completion of training.
- The student will be required to submit a report in handwritten, which will be properly bound.
- The students will be examined through viva-voce by the internal and external examiners. (The external examiner should be from industry).

### 3.3 Maintenance of Daily Diary

The students are required to maintain a daily diary, regularly in systematic manner. After the completion of day's work the important information is recorded clearly as per the instructions of section in charge and get it signed daily by him. Write in brief about observations made, daily work problems / project/s undertaken, discussion held, instructions given by section in charge, literature consulted, data etc.

### 3.4 Evaluation of daily diary

Term work assessment is based on daily diary maintenance, attendance, remarks of industry. Term-work Marks will be given on the basis of evidence of diary maintenance, adequacy and quality of record.

### 3.5 Specific areas of study and working: -

Students are required to collect the relevant information on the specific area given below. This information should be recorded in daily diary and further used in preparing the Final Report.

#### (a) General Information

1. Name of mill, address, and year of establishment.
2. Type of organization, growth in terms of investment, assets, employment, sales, turnover, product diversification, technological development.
3. Training orientation programmer of the organization.
4. Employee's welfare schemes like PF, Medical, Canteen, Training, Recreation facilities etc.
5. Detailed lay out of the mill, number of spindles, warp weft, doubling, and total number of looms. (Non-automatic, automatic and total.)
6. Yarn counts spun-warp and weft. Average count of the yarn used.
7. Details of shifts: shift wise technical staff & number of workers in processing.
8. Quantity of fabrics produced in sq. meters. Quantity of fabrics exported in sq. meters. Types of finish given.

9. Brief study of activities in quality control department.

**(b) Grey Checking**

1. Lay out plan, lighting scheme and fire prevention methods.
2. Handling and transportation of fabric.
3. Methods of checking.
4. Classification of faults.
5. Segregation of various sorts.
6. Process control exercised in gray checking.
7. Labour complement.
8. Power requirements.
9. Operative hours and production.

**(c) Desizing**

1. Lay out plan, lighting scheme and fire prevention methods.
2. Handling and transportation of fabric.
3. Type of desizing.
4. Desizing recipe and duration.
5. Labour complement.
6. Details of machineries used in desizing, if any.
7. Operative hours and production.
8. Water and steam consumption.
9. Power requirements.
10. Process control exercised in desizing.
11. Quality Control in desizing.
12. Costing.

**(d) Scouring**

1. Layout plan, lighting scheme and fire prevention methods.
2. Handling and transportation of fabric.
3. Types of scouring.
4. Scouring recipe, duration, temperature, and pressure.
5. Water and steam consumption.
6. Power requirements.
7. Operative hours and production.
8. Labour complements.
9. Process control followed in scouring.
10. Time study and work study in scouring.
11. Costing.

**(e) Mercerization**

1. Layout plan, lighting scheme and power requirements.
2. Handling and transportation of fabric.
3. Type of mercerization.

4. Details of mercersing agents and auxiliaries like wetting agents used in mercerization.
5. Study of mercerization of various sorts
6. Steam and water consumption.
7. Operative hours and production.
8. Labour complements
9. Process control followed in mercerization.
10. Quality control in mercerization.

**(f) Singeing**

1. Layout plan, lighting scheme and power requirements
2. Handling and transportation of fabric
3. Type of singeing.
4. Operative hours and production.
5. Labour complement.
6. Process control in Singeing.

**(g) Bleaching**

1. Layout plan, lighting scheme and power requirements.
2. Handling and transportation of fabric.
3. Type of bleaching
4. Study of bleaching of various sorts like Poplin, cambric, polyester, polyester/cellulosic blends, top dyed goods, terry towel etc.
5. Detailed study of machines used in bleaching.
6. Steam and water consumption.
7. Process control.
8. Quality control.
9. Labour complement.

**(h) Dyeing**

1. Layout plan, lighting scheme and power requirements.
2. Handling and transportation of fabric.
3. Detailed of dyeing machines like jigger, jet-dyeing machine, winch, padding mangle, beam dyeing, loose fibre dyeing machine, etc.
4. Steam and water consumption.
5. Labour complement.
6. Process control in jigger dyeing, HTHP beam dyeing, jet dyeing, winch dyeing, fibre dyeing and cheese dyeing.
7. Quality control in dyeing.

**(i) Printing**

1. Layout plan, lighting scheme and power requirements.
2. Handling and transportation of fabric.
3. Detailed study of various printing machines like roller, flat bed screen-printing, and rotary screen-printing m/c.

4. Preparation of screen.
5. Steam and water consumption.
6. Labour complement.
7. Operative hours and production.
8. Process control in printing.
9. Quality control in printing.

**(j) Finishing**

1. Lay out plan, lighting scheme and power requirements.
2. Handling and transportation of fabric
3. Detail study of finishing machines like stenter (steam and oil heated), sanforising, decatizing, calendaring, felt, milling, crabbing steam calendar, finishing machines for hosiery goods.
4. Study of finishing of various sorts of cotton, polyester, acrylic, wool silk nylon, and their blends.
5. Study of axillaries used for finishing of cotton, polyester, acrylic, wool, silk, nylon and their blends
6. Steam and water consumption in finishing.
7. Labour complement.
8. Operative hours and production.
9. Process control in finishing using various machines.
10. Quality control in finishing.

**(k) Drying and Washing**

1. Layout plan, lighting scheme and power requirements.
2. Handling and transportation of fabric.
3. Brief study of various dyeing & washing machine.
4. Steam and water consumption.
5. Labour complement.
6. Operative hours and production
7. Process control in drying.

**(l) Boilers, Thermopac And Effluent Treatment Plant**

1. Layout plan, layout of machine.
2. Steam generation, distribution, and utilization.
3. Boiler feed water.
4. Operative hours and production.
5. Study of various oils used in thermopac.
6. Water management
7. Effluent treatment plant

**(m) Costing**

1. Fabric cost sheets for some sorts. Cost of dyes, chemicals
2. Wages of the time rate workers and their rate in each dept.



3. Wages for piece rate workers in each dept.
4. Power cost.
5. Cost of water and steam.
6. Government levies classification wise.

**(n) Laboratory**

1. Testing and analysis of dyes, chemicals, and auxiliaries used in various departments.
2. Testing of bleached, dyed, and fabric, with respect to fastness properties.
3. Methods towards inventory control.

**Assessment Strategy**

- a) Report of the industrial training shall be prepared by each student on the basis of his/her actual work done, during the six weeks industrial training.
- b) This report should be submitted in typed and bound form within 1 month after completion of the industrial training.
- c) Industrial training should be assessed equally by external and internal examiners for the oral exam assessment.
- d) Industrial training should be assessed by internal examiner only for term work assessment.