

**Syllabus for Two Years Program
in
M.Sc. (Textile Chemistry)
(Under the National Education Policy, NEP 2020)**



Offered by

**DEPARTMENT OF FIBRES AND
TEXTILE PROCESSING
TECHNOLOGY**

INSTITUTE OF CHEMICAL TECHNOLOGY

(University Under Section-3 of UGC Act, 1956)

Elite Status and Center for Excellence

Government of Maharashtra

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A. Preamble:

Almost five years ago, in 1933, when the Indian Textile Industry was progressing in-full swing in cities like Mumbai, and Ahmedabad, other industries were not even born. It was when Sir Vitthal Chandavarkar was the Vice Chancellor of the University of Mumbai and the Textile Mill Owners` Association Chairman.

Thus, the Department of Fibres and Textile Processing Technology (FTPT), formerly known as the Textile Chemistry Section, has the unique distinction of being the first discipline with which this institution started. The Department conducts M.Sc. Textile Chemistry Course with an intake capacity of 20. The course involves the study of fibre chemistry, and its chemical processing such as bleaching, dyeing, printing and finishing. It further encompasses the study of chemistry as well as the application of various kinds of chemicals, dyes, thickeners, and finishing auxiliaries that are used in chemical processing of textile fabrics and garments. It also involves knowledge of green chemistry, biotechnology and nanotechnology with special reference to the chemical processing of textiles.

The other graduate and postgraduate courses of B. Tech and M. Tech. in Fibres and Textile Processing Technology, Ph.D. (Tech.) in Fibres and Textile Processing Technology, Ph.D. (Sci.) in Textile Chemistry and Ph.D. (Sci.) in Chemistry attract a large number of students and so far, more than 2500 graduates and 500 postgraduates have passed out from this Department. The faculty of the Department has good interaction with the industry. Several industries and institutions have signed MOUs for research collaboration with us. Under these MOUs we offer Ph.D. and M. Tech. courses to their scientists. Several industries have benefited from the technical advice given by the faculty. There have been a number of industrial and governmental research projects in which problems of mutual interest.

B. Regulations Related to the Degree of Master of Science in Textile Chemistry (M. Sc. in Textile Chemistry) Degree Course

1. Intake

20 candidates shall be admitted every year. The distribution of seats shall be as per the Institute's norms.

2. Admission

The admission to M.Sc. (Textile Chemistry) program in the ICT Mumbai campus shall be strictly based on merit in the entrance examination conducted by the Institute. To be eligible for admission to the program, a candidate must fulfil the following criteria:

- a. Candidates who have taken the post-H.S.C. 3-year degree course of Bachelor of Science and passed the qualifying examination with at least 55% of the marks in aggregate or equivalent grade average.
- b. The admissions will be done strictly based on merit; the marks obtained in the entrance test conducted by ICT.
- c. The candidates who have cleared the qualifying examination in one sitting will be preferred.

3. Course structure

The important points regarding the structure of the 2-year (four-semester) M.Sc. Textile Chemistry Course are as follows:

- a. The course is a credit-based 4-semester (2-year) course.
- b. Each semester will incorporate 16 weeks of instruction and there will be 20 credits for each semester.
- c. The course has an exit option after one year with a "Diploma" as per the guidelines of NEP 2020.
- d. There will be two semesters in a year:
 - i. Semester – I and Semester – III (July to December)
 - ii. Semester – II and Semester – IV (December to May)
 - iii. Each semester will consist of 15-16 weeks of instructions including seminars / projects/assignments.
- e. The On Job Training (OJT) will be at the end of second semester (during summer) for 8 – 10 weeks and carries 4 credits.

- f. At the end of each semester the candidates will be assessed as per the norms of the Institute.
 - g. Semesters will be governed by the academic calendar of the institute.
 - h. The requirement of attendance of the students shall be as per the norms of the Institute.
 - i. All the relevant academic regulations of the Institute shall be applicable to the course.
 - j. Assessment of the students will be done as per the norms of the Institute.
 - k. In case of any difficulty regarding any assessment component of the course, the Departmental Committee shall take appropriate decision, which will be considered final.
- l. **Electives: One elective to be offered per semester.** The electives to be offered during a given semester will be declared by the Head of Department before the commencement of the semester. Any elective course, in addition to those mentioned in the current syllabus, may be offered to the students after due approval.
- m. **Internship / Field project:** Completion of internship or field project is a compulsory criterion for awarding the PG Diploma or the PG degree. The field project / internship should be of a minimum duration of 4 weeks and will be schedule after semester 2 and before commencement of semester 3. The assessment of the field project / internship will be as per the prescribed format.
- n. **Research Project:**
- 1. At the end of the Second semester, the Head of Department consultation with the Departmental Committee will assign topics for the Research Projects (4 credits) to the students and assign the supervisors.
 - 2. The students will do the Research Projects (6 credits) in semesters III and IV on the topics assigned under the supervision of the assigned faculty member.
 - 3. The students shall submit the project report before the prescribed date which will be a date before the last date of semester IV. The report shall be submitted with soft binding.
 - 4. The project report will be examined by the supervisor along with one other internal/external referee to be appointed by the Departmental committee. The referees shall give marks to the report as per the norms.
 - 5. The students will make presentations on the work in front of the Project Evaluation Committee (PEC) appointed by the Departmental Committee, in open defense form. The PEC will give marks to the presentation.

6. The comments received from the referees as well as given by the PEC need to be incorporated in the final project report in consultation with the supervisor.

C. Programme Outcomes (POs) for M.Sc. Textile Chemistry

PO1	Fundamental Knowledge of Textile Chemistry: Apply the knowledge of Textile Chemistry specialization to solve complex textile processing and testing problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using the first principles of Chemistry, Textile Processing, and Analytical Chemistry.
PO3	Design/development of solutions: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety and cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern analytical and IT tools, including prediction and modeling to complex R&D activities with an understanding of the limitations.
PO6	The Scientist and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
PO7	Environment and sustainability: Understand the impact of professional scientific solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice.
PO9	Individual and teamwork: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex R&D activities with the scientific community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the science and management principles and apply these to one's own work as a member and leader in a team, to manage projects and in multidisciplinary

	environments.
PO12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Program Specific Outcomes (PSOs) for M.Sc. Textile Chemistry

PSO1	Develop a confident graduate who can offer solutions on complex problems to the shop floor from fibre to garment textile processing field.
PSO2	Instill fundamental knowledge and motivation to go for advanced studies and research so that they can develop themselves into Academician and Research scientists making positive contribution to generation and dissemination of new knowledge.
PSO3	Introduce the diverse textile segments and emerging Textile Technologies to create a thirst among the students for innovative start- up or career options taking advantage of the fast-developing Indian economy.
PSO4	Aware of the environmental and societal impact of textile chemistry and work within the periphery for the good of society and the scientific world.

M.Sc. in Textile Chemistry
(Under NEP 2020)
Fibres and Textile Processing Technology
Institute of Chemical Technology, Mumbai.

SEMESTER – I									
Subject code	Subjects	Credits	Hrs/ Week			Marks for various Exams			
			L	T	P	CA	MS	ES	Total
	Elective 1	4	3	1	0	20	30	50	100
TXT2905	Research Methodology	4	3	1	0	20	30	50	100
TXT2106	Chemistry of natural and man-made fibers	4	3	1	0	20	30	50	100
TXT2703	Chemistry of intermediates and dyes	4	3	1	0	20	30	50	100
TXT2206	Chemistry of textile auxiliaries	2	1	1	0	20	30	50	100
TXP2025	Textile chemicals and fibers analysis	2	0	0	4	0	50	50	100
	Total	20	13	5	4				600
SEMESTER – II									
Subject code	Subjects	Credits	Hrs/ Week			Marks for various Exams			
			L	T	P	CA	MS	ES	Total
	Elective 2	4	3	1	0	20	30	50	100
TXT 2207	Pretreatment of textiles	2	1	1	0	20	30	50	100
TXT2216	Physicochemical aspects of coloration	4	3	1	0	20	30	50	100
TXP2008	Pre-treatment lab	2	0	0	4	00	50	50	100
TXP2027	Coloration of textiles	4	0	0	8	00	50	50	100
TXP2026	Field project	4	0	0	0	00	50	50	100
	Total	20	7	3	12				600
SEMESTER – III									
Subject code	Subjects	Credits	Hrs/ Week			Marks for various Exams			
			L	T	P	CA	MS	ES	Total
	Elective 3	4	3	1	0	20	30	50	100
TXT2218	Theory of dyeing	2	1	1	0	20	30	50	100
TXT2217	Physicochemical aspects of finishing	4	3	1	0	20	30	50	100
TXT2210	Textile wet processing machinery	2	1	1	0	20	30	50	100
TXP2028	Finishing of textiles and fastness testing	4	0	0	8	00	50	50	100
TXP2020	Project I (Literature survey, project plan, and proof of concept)	4	0	0	8	00	50	50	100
	Total	20	8	4	16				600
SEMESTER IV									
Subject code	Subjects	Credits	Hrs/ Week			Marks for various Exams			
			L	T	P	CA	MS	ES	Total
	Elective 4	4	3	1	0	20	30	50	100

SEMESTER – I									
Subject code	Subjects	Credits	Hrs/Week			Marks for various Exams			
			L	T	P	CA	MS	ES	Total
TXT2305	Textile testing and evaluation	4	3	1	0	20	30	50	100
TXT2306	Certifications in textile value chain	4	3	1	0	20	30	50	100
TXP2023	Analysis and application of auxiliaries and colorants	2	0	0	4	00	50	50	100
TXP2022	Project II	6	0	0	12	00	100	100	200
	Total	20	9	3	16				600

E. Elective Subjects

Sr. no	Subject code	Elective subjects (M.Sc. Textile Chemistry)	Credits	Hrs./Week			Marks for various Exams			
				L	T	P	CA	MS	ES	Total
Semester I										
1.	TXT 2106	Technology of Textile Polymers	4	3	1	0	20	30	50	100
2.	PYT2307	Colour Physics & applications	4	3	1	0	20	30	50	100
3.	TXT 2503	Smart textiles	4	3	1	0	20	30	50	100
Semester II										
1.	TXT2105	Manufacturing of Yarn and Fabric	4	3	1	0	20	30	50	100
2.	TXT 2702	Textile Physics	4	3	1	0	20	30	50	100
3.	TXT 2806	Sustainable Textile Processing	4	3	1	0	20	30	50	100
Semester III										
1.	TXT 2501	Technical Textile	4	3	1	0	20	30	50	100
2.	TXT 2504	Nonwoven and Hi-Tech Fibres	4	3	1	0	20	30	50	100
3.	TXT 2906	Textile Process House Management	4	3	1	0	20	30	50	100
Semester IV										
1.	PYT2403	Material Characterization Techniques	4	3	1	0	20	30	50	100
2.	TXT 2403	Garment manufacturing and Merchandizing	4	3	1	0	20	30	50	100
3.	TXT 2804	Management of Textile Waste	4	3	1	0	20	30	50	100
4.	TXT 2805	Water analysis and effluent treatment	4	3	1	0	20	30	50	100

F. Detailed Syllabus**SEMESTER I**

Course Code: TXT2905	Course Title: Research Methodology	Credits = 4		
		L	T	P
Semester: I	Total contact hours: 60	3	1	0
List of Prerequisite Courses				
Previous (during undergraduate) exposure to the research project(s) is desirable but not necessary.				
List of Courses where this course will be prerequisite				
Project-I (TXP2020) and Project- II (TXP2022)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
The formal exposure to various elements of research methods such as problem formulation, literature search, planning of various activities, documentation, budgeting, purchase, report/thesis compilation, manuscript writing, patent drafting, is critical for polishing the naïve research attitude and aptitude in the PG students of the programme. The course is designed to formally introduce various concepts of research methodology in stepwise manner to the students.				
Sr. no.	Course Contents (Topics and subtopics)			Reqd. hrs
1.	Research Meaning of Research, Purpose of Research, Types of Research (Educational, Clinical, Experimental, Historical, Descriptive, Basic applied and Patent Oriented Research) – Objective of research Literature survey – Use of Library, Books, & Journals – Medline – Internet, getting patents and reprints of articles as sources for literature survey. Selecting a problem and preparing research proposal for different types of research mentioned above. Methods and tools used in Research <ul style="list-style-type: none"> • Qualitative studies, Quantitative Studies • Simple data organization, Descriptive data analysis • Limitations and sources of Error • Inquiries in form of Questionnaire, Opinionnaire or by interview • Statistical analysis of data including variance, standard deviation, students ‘t’ test and annova, correlation data and its interpretation, computer data analysis 			16
2.	Documentation <ul style="list-style-type: none"> • “How” of Documentation • Techniques of Documentation • Importance of Documentation • Uses of computer packages in Documentation 			6
3.	The Research Report / Paper writing / thesis writing <ul style="list-style-type: none"> • Different parts of the Research paper 1. Title – Title of project with author’s name 2. Abstract – Statement of the problem Background list in brief and purpose and scope 			10

	3. Keywords 4. Methodology-Subject, Apparatus / Instrumentation, (if necessary) and procedure	
4.	Results – tables, Graphs, Figures, and statistical presentation Discussion – Support or non-support of hypothesis – practical & theoretical implications, conclusions Acknowledgments References Errata Importance of spell check for Entire project Use of footnotes	6
5.	Presentation (Specially for oral) • Importance, types, different skills • Content of presentation, format of model, Introduction and ending • Posture, Gestures, Eye contact, facial expressions stage fright • Volume- pitch, speed, pauses & language • Visual aids and seating Questionnaire	6
6.	Protection of patents and trademarks, Designs and copyrights • The patent system in India – Present status Intellectual property Rights (IPR), Future changes expected in Indian Patents • Advantages • The Science in Law, Turimetrics (Introduction) • What may be patented • Who may apply for patent • Preparation of patent proposal	10
7.	Sources for procurement of Research Grants Industrial- Institution Interaction - Industrial projects – Their feasibility reports	6
	Total	60
List of Textbooks/ Reference Books		
1.	Research in Education – Johan V. Best James V. Kahn	
2.	Presentation skills- Michael Halton- Indian Society for Institute Education	
3.	A Practical Introduction to copy right – Gavin Mcfarlane	
4.	Thesis projects in Science and Engineering – Richard M. Davis	
5.	Scientists in legal system – Ann labor science	
6.	Thesis and Assignment writing – Jonathan Anderson	
7.	Writing a technical paper- Donald Menzel	
8.	Effective Business Report writing – Leland Brown	
9.	Spelling for the million – Edna furness	
10.	Preparing for publication – King Edwards Hospital fund for London	
11.	Information technology – The Hindu speaks	
12.	Documentation – Genesis & Development 3792	
13.	Manual for evaluation of Industrial projects – United Nations	
14.	Manual for the preparation of Industrial feasibility studies	
Course Outcomes (students will be able to.....)		
CO1	Understand the basic concepts of research and the components therein, formally.	K2
CO2	Apply in-depth knowledge of the documentation and literature survey in research	K3

	design.	
CO3	Evaluate the importance of various parts of a research report/paper/thesis in the presentation of research results.	K4
CO4	Understand the significance of various types of IPRs in research.	K1
CO5	Create a model research project.	K5

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	2	3	3	0	3	3	0	2
CO2	2	1	0	1	1	0	3	3	2	3	3	0
CO3	3	2	1	2	0	3	3	3	3	2	3	1
CO4	3	2	1	1	1	3	2	3	3	3	3	1
CO5	3	2	3	3	3	2	2	3	1	1	3	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	2	2	1	1
CO3	3	2	0	0
CO4	1	2	1	0
CO5	3	3	3	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2106	Course Title: Chemistry of natural and man-made fibers	Credits = 4		
		L	T	P
Semester: I	Total contact hours: 60	3	1	0
List of Prerequisite Courses				
B.Sc. (Chemistry)				
List of Courses where this course will be prerequisite				
(TXT2216) Physicochemical aspects of coloration, (TXT2207) Pretreatment of textiles, (TXT2217) Physicochemical aspects of finishing, (TXT2305) Textile Testing and Evaluation (TXT2305)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
Students will have a better understanding of different natural and synthetic fibres, their properties as well as an essential concept of polymer chemistry which will help in manufacturing as well as designing processing parameters.				

Sr. No.	Course contents(topics/subtopics)	Reqd. hrs
1.	Classification of fibers; Occurrence of polymeric materials; Fiber forming characteristics of polymers	4
2.	Study of natural fibers such as cotton, Organic Cotton, wool, silk, ramie, jute, linen, pineapple, Natural Bamboo fibers (not by rayon route), etc.	10
3.	Their occurrence, properties, and uses.	4
4.	Morphology and chemical constitution.	8
5.	Physical and chemical properties	4
6.	Spinning techniques; Spin Draw Process; Concept of LOY, MOY, POY and FOY.	3
7.	Introduction to drawing and heat setting in thermoplastic fibers, role of spin finish and fiber crimp in processing.	3
8.	Regenerated fibers such as viscose, cuprammonium, acetate, Tencel, etc.	4
9.	Raw materials, manufacture process, and uses of semisynthetic fibers; Morphology	4
10.	Physical and chemical properties of semisynthetic fibers	4
11.	Synthetic fibres include polyester, differentially dyeable polyester, polyamides, acrylic, polypropylene, polyvinyl alcohol, polyurethane.	4
12.	Microfibres, manufacture, physical and chemical properties and uses;	4
13.	Various modified forms of Synthetic fibers like antistatic, antipilling, etc.	4
Total		60
List of Textbooks/ Reference Books		
1.	Textile fibers, Shenai V.A., Vol-1, Sevak Publications, Bombay, 3rd edition, 1991.	
2.	Joseph's Introductory Textile Science, Joseph, M.L., Hudson P.B., Clapp A. C., Fortworth: Harcourt Brace Jovanovich College Publication, 6th edition, 1993.	
3.	Modern Textile Characterization Methods, Raheel, M. Marcel Dekker Inc., New York, 1996.	
4.	Microscopy of Textile Fibers, Greaves, P.H., Saville B.P.Oxford : BIOS Scientific Publishers Ltd., 1995.	
5.	Handbook of Fiber Chemistry, Lewin Menachem, Eli M. Pearce, Marcel Dekker Inc., New	
6.	Textile Fibers-I, Mathews, J.M, 4th edition, 1924.	
7.	Wool Handbook, Bergon W.V., Interscience Publishers, New York, 3rd edition, 1970.	
8.	Textile Chemistry, Peters R.H, Vol-1, Elsevier Publishing Company, London, 1963.	
Course Outcomes (students will be able to.....)		
CO1	Understand fiber forming properties with different textile terms following various stages of processing and differentiate them according to the classification Textile Fibers.	K1

CO2	Acquire deeper understanding and insights in basic chemistry, production processes, and physical and chemical properties of Natural and Synthetic fibers.	K3
CO3	Analyze structure-property relationships and choose fibers or develop a combination of fibers for specific applications to meet novel requirements.	K2
CO4	Acquire a deeper understanding and insights in basic chemistry, production processes and physical and chemical properties of Natural and Synthetic fibers for the non-apparel category.	K2
CO5	Justify fiber properties/end uses and depict or design the single or combinations of Fiber system for value addition to meet the strategic requirements.	K2

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	3	3	3	3	1	3	2
CO2	3	2	2	3	3	2	3	3	2	3	2	2
CO3	3	1	0	2	1	3	2	2	3	3	3	1
CO4	3	3	2	1	1	2	3	3	3	2	0	2
CO5	3	2	2	3	2	3	3	2	2	3	3	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	1	1	2	1
CO3	3	3	2	1
CO4	3	2	2	1
CO5	3	3	3	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution

K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2703	Course Title: Chemistry of intermediates and dyes	Credits = 4		
		L	T	P
Semester: I	Total contact hours: 60	3	1	0
List of Prerequisite Courses				
B.Sc. Chemistry				
List of Courses where this course will be prerequisite				
Physicochemical aspects of coloration (TXT2216), Textile testing and evaluation (TXT2305)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				

Students will understand the chemistry behind the colorants. They will be able to explain its textile applications according to the chemistry involved.		
Sr. No.	Course contents(topics/subtopics)	Reqd. hrs
1.	Colorant classification, general principles of dyeing, the concept of colour index for colorants, introduction to dyes and pigments;	6
2.	Theory of color formation in organic compounds, the effect of auxiliary groups on the shade and hue of the pigment (Bathochromic and hyper chromic shift)	6
3.	Azo dyes: Diazotisation and coupling reactions, azoic colours, acid dyes, mono azo dye; diasazo, nitro, diphenylamine and anthraquinone dyes; acid mordant dyes, azo metal complex dyes, direct dyes	14
4.	Basic dyes: Diphenylmethane and triphenylmethane dyes and heterocyclic analogues, triphenodioxazine dyes. Disperse dyes: azo, anthraquinone, dinitrophenylamine, methine dyes; properties in relation to constitution	14
5.	Vat dyes: Indigoid, anthraquinonoid, and polycyclic quinonoid dyes; solubilized vat dyes. Sulphur dyes and sulphurated vat dyes	10
6.	Reactive dyes: Chlorotriazine and other halo heterocyclic compounds, vinyl sulphone dyes, high fixation, highly substantive, neutral fixing, bifunctional	10
Total		60
List of Textbooks/ Reference Books		
1.	Color Chemistry, 3rd Edition, Heinrich Zollinger, Wiley – VCH 2003	
2.	Colorants and Auxiliaries: Colorants v. 1: Organic Chemistry and Application Properties, John Shore, Society of Dyers & Colourists; 2nd edition edition (Jan. 2002)	
3.	The Chemistry of Synthetic dyes, K. Venkataraman, Academic Press (1 January 1971)	
4.	Industrial Inorganic Pigments, Gunter Buxbaum, Wiley-VCH; 1 edition (March 11, 2005)	
5.	Industrial Organic Pigments: Production, Properties, Applications, 3rd, Completely Revised	
6.	Application Properties of Pigments By A.Karnik, First Edition Thane 1999	
Course Outcomes (students will be able to.....)		
CO1	Understand fundamental knowledge on basics of chemistry involved in the colorants.	K2
CO2	Describe the types of pigments.	K2
CO3	Understand and explain the physical properties of Pigments and dyes.	K2
CO4	Explain the synthetic methods used for azo dyes and their properties.	K2
CO5	Explain the types of dyes based on application, properties.	K2

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	2	3	3	2	1	2	3
CO2	2	1	3	2	1	2	2	2	2	2	2	2
CO3	3	3	2	3	1	3	3	2	1	2	2	3
CO4	3	2	2	3	2	2	3	1	0	1	1	3
CO5	3	3	3	2	1	2	1	0	0	0	0	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1
CO2	3	2	3	1
CO3	2	2	2	1
CO4	3	3	3	1
CO5	3	3	2	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2206	Course Title: Chemistry of Textile Auxiliaries	Credits = 2		
		L	T	P
Semester: I	Total contact hours: 30	1	1	0
List of Prerequisite Courses				
B.Sc. (Chemistry)				
List of Courses where this course will be prerequisite				
Pretreatment of textiles (TXT2207), Physicochemical aspects of coloration (TXT2216), Physicochemical aspects of finishing (TXT2217)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
The course will provide students with a deep understanding about the role of different functional groups on the properties of various specialty chemicals used in different industries.				
Sr. No.	Course contents(topics/subtopics)			Reqd. hrs
1.	Nomenclature, functions, and Classification of textile auxiliaries			4
2.	Surfactants and their applications. Concept of HLB			5
3.	Chemistry, properties & uses of anionic, cationic, non-ionic, and amphoteric surfactants.			8

4.	Qualitative and quantitative evaluation of auxiliaries; Testing of surfactants	5
5.	Auxiliaries used in the pre-treatment, coloration, and finishing of textiles.	6
6.	Recent developments in textile auxiliaries	2
Total		30
List of Textbooks/ Reference Books		
1.	Colourants and Auxiliaries: Organic Chemistry and Application Properties, Shore, J., SDC, Bradford, 1990.	
2.	Laundry Detergents, Smulders, E., Wiley VCH, Weinheim, 2002.	
3.	Chemistry and Textile Auxiliaries, Shenai V.A., Vol. 65, Sevak Publication, Bombay, 2nd	
4.	Textile Auxiliaries, Batty, J.W., Dergamon Press, Oxford, 1967.	
5.	Textile Chemicals and Auxiliaries, Speel H.C., Reinhold Processing Corporation, New York,	
Course Outcomes (students will be able to.....)		
CO1	Understand fundamentals of textile auxiliaries.	K2
CO2	Describe the role of surfactants in textiles and their different types.	K2
CO3	Write synthesis of important textile auxiliaries.	K2
CO4	Evaluate surfactants and identify the ionic nature.	K3
CO5	Explain the biodegradability of surfactants and eco-friendly textile auxiliaries.	K2

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	1	3	1	3	3	1	3	1
CO2	3	3	2	2	2	1	3	3	3	3	2	2
CO3	3	3	1	3	2	2	3	2	0	3	3	0
CO4	3	1	3	3	3	3	2	3	3	2	3	3
CO5	3	2	1	0	0	1	3	1	0	0	1	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	3	3	2	2
CO3	2	2	2	0
CO4	2	2	1	12
CO5	2	2	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution

K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2025	Course Title: Textile chemicals and fibers analysis	Credits = 2		
		L	T	P
Semester: I	Total contact hours: 60	0	0	4
List of Prerequisite Courses				
B.Sc. (Chemistry)				
List of Courses where this course will be prerequisite				
Pretreatment of textile (TXT2207), Physicochemical aspects of coloration (TXT2216), Physicochemical aspects of Finishing (TXT2217)				
Description of the relevance of this course in the M.Sc. (Textile Chemistry) Program				
It will provide scientific background to students which will help them to understand relation between processing chemicals and fibre substrate.				
Sr. No.	Course contents (topics/subtopics)	Reqd hrs		
1	Estimation of bleaching powder and sodium chlorite	4		
2	Estimation of sodium silicate and sodium carbonate	4		
3	Estimation of composition of alkali mixture and barium hydroxide	2		
4	Estimation of Glauber's salt and sodium chloride	2		
5	Estimation of chrome alum and hardness of water	2		
6	Estimation of sodium hydrosulphite and Rangolite C	2		
7	Estimation of formaldehyde and oxalic acid	2		
8	Estimation of sodium alginate	2		
9	Estimation of acid value and Iodine value of fatty acids	2		
10	Estimation of efficiency of Sizing chemicals	2		
11	Estimation of Chelating agents	2		
12	Estimation of bleaching powder and sodium chlorite	2		
13	Identification of fibres by microscopic method	2		
14	Identification of fibres by chemical methods	2		
15	Identification of fibres from binary blends by chemical methods	2		
16	Identification of fibres from tertiary blends by chemical methods	2		
17	Quantitative analysis of blends	2		
18	Determination of count of yarn	2		
19	Fibre maturity measurements	2		

20	Fibre fineness by Cut-Weight Method	2
21	Measurement of maturity and fineness by airflow instrument	2
22	Determination of twist in double and single yarn	2
23	To measure Yarn Appearance, Hairiness/yarn imperfections (Zwellager)	2
24	To measure Yarn twist/Count	2
25	To determine Types of weave (Weave Diagram)	2
26	To measure Fabric weight (GSM)	2
27	To measure Fabric Count (Ends/pick, Wales/course)	2
28	Determination of the single yarn strength and elongation at break of the yarns	2
Total		60
List of Textbooks/ Reference Books		
1	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol. - 3, 3rd edition, 2003.	
2	Textile Bleaching, Steven A.B., Pitman and Sons, London.	
3	Technology of Scouring and Bleaching, Trotman E.R., Griffin, London, 1968.	
4	Technology of Bleaching and Dyeing, Chakraverty, R.R., Trivedi S.S., Vol. 1, Mahajan Publishers Private Ltd., Ahmedabad, 1979.	
5	Textile Chemistry, Peters R.H, Vol-2, Elsevier Publishing Company, London, 1967.	
6	Sizing by D.B. Ajgaonkar, M.K. Talukdar and V.R. Wadekar	
7	Mercerizing by J.T. Marsh	
8	Chemical Technology in the Pre-treatment Processes of Textiles by S.R. Karmakar	
Course Outcomes (students will be able to.....)		
CO1	Estimate the purity of the different acids, alkali, reducing agents, oxidizing agents used in textile processing.	K4
CO2	Analyze the efficiency e.g. of Sizing chemicals, blend analysis, fibre identification by microscopic and by chemical methods.	K4
CO3	Carry out and use yarn twist/count, Appearance, Hairiness/yarn imperfections, fabric GSM.	K3
CO4	Interpret, examine, and determine twist in double and single yarn, strength and elongation at break.	K4
CO5	Carry out and use measurement of maturity and fineness of fibres by airflow instrument.	K3

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	0	3	3	3	3	3	3	1

CO2	3	2	1	3	1	3	3	2	2	1	3	0
CO3	3	3	3	2	1	2	3	0	3	2	3	2
CO4	3	2	1	2	0	3	3	3	3	3	2	1
CO5	3	3	2	2	1	3	3	3	3	3	3	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	3	3	1	3
CO3	2	3	1	1
CO4	3	2	2	1
CO5	2	2	2	1

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Semester II

Course Code: TXT 2207	Course Title: Pretreatment of Textiles	Credits = 2		
		L	T	P
Semester: II	Total contact hours: 30	1	1	0
List of Prerequisite Courses				
(TXT2106) Chemistry of natural and man-made fibres, (TXT2206) Chemistry of textile auxiliaries				
List of Courses where this course will be prerequisite				
(TXT2216) Physicochemical aspects of coloration, (TXT2217) Physicochemical aspects of finishing				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
Being the initial stage of wet processing, the knowledge of pretreatment is significant to understand further processing stages such as dyeing, printing, and finishing.				
Sr No.	Course Contents (Topics and subtopics)			Reqd. hrs
1.	Sizing, Sizing Chemicals; Various pretreatment sequences for different varieties of textiles.			3
2.	Shearing and Cropping; Singeing, latest technologies in singeing, Desizing of cotton; different desizing methods.			3
3.	Techniques for scouring and bleaching cotton; Machinery used for these preparatory processes Mercerization, caustic recovery plant and its efficiency.			3
4.	Ammonia mercerization, its significance, additional benefits, Heat setting, Silk			3

	degumming and bleaching;	
5.	Scouring and bleaching of wool; Bio scouring, Carbonization of wool.	2
6.	Scouring and bleaching of synthetics and their blends with natural fibers.	2
7.	Bleaching and various auxiliaries in bleaching.	3
8.	Washing principles and methods used different types of continuous washers for textiles.	2
9.	Concept of conservation of chemicals, energy and water, Raw materials like water, chemicals and auxiliaries.	3
10.	Pretreatment of Knit goods; Mercerization of Knits.	3
11.	Pretreatment of Yarn and cone dyed yarns.	3
Total		30

List of Textbooks/ Reference Books

1	Textile Bleaching, Steven A.B., Pitman and Sons, London, 1947
2	Mercerizing by J.T.Marsh; 1951
3	Textile Chemistry, Peters R.H, Vol-2, Elsevier Publishing Company, London, 1967.
4	Technology of Scouring and Bleaching, Trotman E.R., Griffin, London, 1968.
5	Sizing by D.B.Ajgaonkar, M.K.Talukdar and V.R.Wadekar; December 1969
6	Technology of Bleaching and Dyeing, Chakraverty, R.R., Trivedi S.S., Vol. 1, Mahajan Publishers Private Ltd., Ahmedabad, 1979.
7	Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar, 1999
8	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol.3, 3rd edition, 2003.

Course Outcomes (students will be able to..)

CO1	Comprehend the need for the singeing of loom state fabric and use of latest technologies for open width woven and knit fabrics.	K2
CO2	Explain the need for the sizing of yarns and desizing of fabric, sizing chemicals and different desizing methods.	K2
CO3	Elaborate the different scouring and bleaching recipes for natural and synthetics textiles and their blends.	K3
CO4	Illustrate methods for the pretreatments of wool and silk.	K3
CO5	Elaborate the different washing processing used for textiles and their blends	K2

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	3	3	3	3	3	2
CO2	3	2	2	3	0	3	1	3	2	3	1	2

CO3	3	1	0	2	1	2	2	2	3	3	3	0
CO4	3	2	1	3	2	3	3	3	2	3	3	2
CO5	3	2	3	2	3	2	2	1	2	1	2	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	3	3	3	3
CO3	3	3	2	3
CO4	3	2	3	2
CO5	3	2	2	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2216	Course Title: Physicochemical aspects of coloration	Credits = 4		
		L	T	P
Semester: II	Total contact hours: 60	3	1	0
List of Prerequisite Courses				
(TXT2106) Chemistry of natural and man-made fibres, (TXT2703) Chemistry of intermediates and dyes				
List of Courses where this course will be prerequisite				
(TXP2028) Finishing of textile and fastness testing, (TXT2305) Textile testing evaluation, (TXT2218) Theory of dyeing				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
Being the initial stage of wet processing, the knowledge of pretreatment is significant to understand further processing stages such as dyeing, printing and finishing.				
Sr No.	Course Contents (Topics and subtopics)			Reqd. hrs
1.	Physical and chemical characteristics of textile fibres in relation to dyeing			2
2.	Pretreatments of textiles and quality of water in relation to dyeing			1
3.	Colour science, colorants, and their classification			2
4.	An overview of dyeing technology, the parameters of quality dyeing, types of machines and terms used in dyeing; Performance characteristics of dyed textiles			3
5.	Classification of dyes based on application to textiles			1

6.	Dyeing with Direct, Azoic, Vat, Solubilized Vat, Sulphur, and Oxidation colours	6
7.	Dyeing with Acid, Acid Mordant and Premetallized dyes	2
8.	Dyeing of Cationic dyes	2
9.	Dyeing of Indigo and Natural dyes	3
10.	Dyeing of Disperse dyes	2
11.	Dyeing of Reactive dyes	3
12.	Dyeing of blends, Mass coloration, Supercritical dyeing, OBAs, etc.	2
13.	Advances in dyeing techniques	1
14.	Preparation of fabrics for printing; Steps in printing of various fabrics; Historical printing techniques	3
15.	Selection of thickening agents, chemicals and dyestuffs for printing; Formulation and rheological properties of printing pastes	5
16.	Printing of textile materials with different dyes; Printing of blended fibre/fabrics	5
17.	Machines used for printing, steaming and other methods of print development; Brief idea about preparation of flat and rotary screens for printing	6
18.	Different methods of printing and styles of printing; After treatment of printed materials; Faults in printing, their prevention and correction	4
19.	Special printing techniques; Printing of velvet, carpets and knits	3
20.	Ecological printing of textiles; Recent developments in printing machinery and techniques; Concept of conservation of water and chemicals in printing	4
Total		60
List of Textbooks/ Reference Books		
1.	Textile Chemistry, Peters R.H, Vol-3, Elsevier Publishing Company, London, 1975.	
2.	Cellulosic Dyeing by John Shore, SDC Publ., 1995	
3.	Technology of Dyeing, Shenai V.A., Vol. 6, Sevak Publication, Bombay, 1994.	
4.	Textile Chemistry, Peters R.H, Vol-3, Elsevier Publishing Company, London, 1975.	
5.	The Theory and Practice of Wool Dyeing, Bird, C.L., SDC Publ., Bradford, 1972.	
6.	Chemical Principles of Synthetic Fibre Dyeing, S M Burkinshaw, Blaccie Academic & Professional, 1992.	
7.	Handbook of Synthetic Dyes and Pigments, K.M.Shah, Multitech Publishing Company, Bombay, 2nd edition, 1998.	
8.	Technology of Dyeing, Shenai V.A., Vol. 6, Sevak Publication, Bombay, 2nd edition, 1994.	
9.	Introduction to Textile Printing, W. Clarke, Newness Butterworths, London, 4th edition, 1977	
10.	Technology of Printing, V.A.Shenai, Sevak Publications, Bombay, Vol. 4, 1990.	
Course Outcomes (students will be able to..)		
CO1	Understand the importance of various textile raw materials and processing inputs for quality dyeing and printing.	K2
CO2	Apply the procedures and monitor parameters in the dyeing and printing of different	K4

	fibres.	
CO3	Understand the complexities of dyeing and printing to achieve desired outcomes.	K3
CO4	Analyze the types of machinery for each type of fibre form, dyeing parameters, and dyeing methods.	K4
CO5	Comprehend fundamental knowledge on basics of preparation of fabrics for printing; Steps in the printing of various fabrics; Historical printing techniques.	K2
CO6	Apply the recent developments in machinery techniques and special printing techniques.	K3

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	3	1	0	0	2	3
CO2	3	3	3	3	2	2	1	1	1	1	2	3
CO3	3	3	3	3	3	1	3	1	1	1	3	2
CO4	3	3	3	3	2	2	1	2	1	1	2	3
CO5	3	3	2	3	3	2	1	1	0	0	1	2
CO6	3	2	3	2	3	2	2	1	1	2	3	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	3	3	3
CO3	3	1	1	2
CO4	3	3	2	2
CO5	2	3	3	2
CO6	3	3	2	1

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2008	Course Title: Pre-treatment Laboratory	Credits = 2		
Semester: II	Total contact hours: 60	L	T	P
		0	0	4
List of Prerequisite Courses				
(TXT2206) Chemistry of textile auxiliaries, (TXT2207) Pretreatment of textiles, (TXP2025) Textile chemicals and fibres analysis				
List of Courses where this course will be prerequisite				
Textile wet processing machinery (TXT2210), Textile Testing and Evaluation (TXT2305)				

Description of relevance of this course in the M.Sc. (Textile Chemistry) Program		
Being initial stage of wet processing the knowledge on pre-treatment is important to understand further processing and testing.		
Sr No	Course Contents (Topics and subtopics)	Reqd. Hrs
1	Desizing cotton-acid desizing, enzyme desizing, oxidative desizing of cotton.	8
2	Evaluation of desizing efficiency-staining with iodine.	4
3	Scouring of cotton-open boil, pad-steam process.	4
4	Evaluation of scouring efficiency-wetting time, sinking time, and loss in weight.	4
5	Bleaching of Cotton by hydrogen peroxide.	4
6	Bleaching of nylon and polyester with sodium chlorite and hydrogen peroxide, respectively	8
7	Evaluation of bleaching efficiency -whiteness index and	4
8	Mercerisation of cotton with and without tension.	4
9	Evaluation of mercerization-Shrinkage, dye uptake, strength and elongation, and microscopic observation.	4
10	Scouring and bleaching of wool	4
11	Degumming and Bleaching of Silk.	4
12	Scouring and bleaching of polyester/cotton blends.	4
13	Application of OBA/FBA on natural and synthetic fabrics and evaluation of fabric.	4
Total		60
Course Outcomes (students will be able to.....)		
CO1	Carry out desizing, scouring and bleaching of cotton by different methods and its evaluation by suitable methods.	K3
CO2	Prepare textile materials for further processing by scouring and bleaching of cellulose, degumming and bleaching of Silk for coloration.	K3
CO3	Perform mercerization of cotton and measurement of its efficiency by shrinkage, Barium Activity Number (BAN), dye uptake, strength.	K4
CO4	Apply semi-continuous and continuous processes in pretreatment of textiles.	K4
CO5	Evaluate efficiency of pretreatment and associated impact on fibre degradation.	K4

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2	3	3	3	3	3	3	2
CO2	3	3	3	0	3	3	2	3	1	3	2	3
CO3	3	3	2	3	2	2	1	2	3	0	3	2

CO4	3	3	2	2	2	3	3	2	2	3	3	1
CO5	2	3	3	3	3	1	3	3	2	2	3	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	3
CO2	3	2	2	3
CO3	3	2	1	3
CO4	3	2	1	3
CO5	3	2	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2027	Course Title: Coloration of textiles	Credits = 4		
		L	T	P
Semester: II	Total contact hours: 60	0	0	8
List of Prerequisite Courses				
Physicochemical aspects of colouration (TXT2216), Chemistry of natural and manmade fibres (TXT2106), Chemistry of textile auxiliaries (TXT2206), Chemistry of intermediates and dyes (TXT2703)				
List of Courses where this course will be prerequisite				
Textile testing and evaluation (TXT2305)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
The practical will enable students to perform dyeing and printing on different textile substrates using various classes of dye by different methods of application.				
Sr No	Course Contents (Topics and subtopics)			Reqd. Hrs
1.	To study the effect of liquor ratio, percentage shade and salt concentration on exhaust dyeing of direct dyes on cotton yarn			2
2.	To study dyeing of different types of reactive dyes (exhaust-HE, HBF) on cotton knit fabric, viscose, jute and linen woven fabric			2
3.	To study dyeing and after treatments of sulphur black dye on cotton yarn			2
4.	To study the dyeing of vat dyes on cotton yarn by vatting and pigmentation methods			2

5.	To study dyeing of azoic colors on cotton fabric by tie and dye method	2
6.	To study dyeing of acid dyes (Levelling and 1:2 metal complex) on wool and silk	2
7.	To study dyeing of polyesters and Nylon using disperse dyes by HTHP and carrier method	2
8.	To study dyeing of Nylon with acid, reactive and direct dyes	2
9.	To study dyeing of acrylic fabric with modified cationic dyes	2
10.	Dyeing of cotton fabric with reactive dyes by Cold-pad-batch and vat dye by pad-jig method	2
11.	Dyeing of Polyester/cotton fabric with disperse + vat dyes and disperse +reactive dyes by Pad-dry-thermosol -pad-steam method	4
12.	Dyeing of Polyester/cotton fabric with vat dyes by Pad-dry-cure method	4
13.	Print paste preparation, viscosity measurement, Screen making,	2
14.	Methods of printing – block, screen, stencil, roller	2
15.	Direct style of printing of Reactive Dyes on cotton (H/P) class – various fixation methods (steamer, silicate and baking)	4
16.	Direct style printing on Polyester with Disperse dyes	2
17.	Direct style printing on Nylon Acid, Direct and reactive dyes	2
18.	Direct style of printing on acrylic with Basic Dyes, Pigments on cotton, polyester and PC blend	4
19.	Discharge style of printing – white discharge under Reactive dyed ground, reactive (ND) under reactive (D) dyed ground	4
20.	Discharge style of printing – Vat discharge under reactive dyed ground, pigment under reactive dyed ground	4
21.	Resist style of printing – White resist under reactive dyed ground, pigment under reactive dyed ground	4
22.	Special print effects – Tie and Dye, batik, crimp, brasso, spray, marble, transfer, digital	4

List of Textbooks/ Reference Books

1.	Gile's Laboratory Course in Dyeing, D G Duff and R S Sinclair, SDC Publ.
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Course Outcomes (students will be able to.....)

CO1	Analyze effect of various parameters on dyeing and printing of cotton with different classes of dyes.	K4
CO2	Demonstrate colouration of natural and synthetic fibres using different class of dyes.	K3
CO3	Carry out different dyeing and printing effects on textiles using dyes.	K5
CO4	Achieve different printing effects by varying fibres, application methods and machinery.	K4
CO5	Evaluate performance effect of different classes of dyes on fibres.	K4

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	3	1	3
CO2	3	2	2	2	3	2	2	2	3	3	2	3
CO3	3	3	3	2	3	2	3	3	3	2	1	3
CO4	2	2	3	3	3	3	3	2	2	2	2	2
CO5	2	3	3	3	3	2	2	2	2	3	2	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2
CO2	2	3	3	3
CO3	3	2	2	2
CO4	3	3	3	2
CO5	3	3	3	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2026	Course Title: Field Project	Credits = 4		
		L	T	P
Semester: II	Total Contact Hours: 15 Weeks	0	0	0
List of Prerequisite Courses				
Physicochemical aspects of coloration, Textile wet processing machinery, Pretreatment of textiles				
List of Courses where this course will be prerequisite				
Nil				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
1. Develop systematic thinking about an industrial problem 2. Develop skills for communication, networking, personal grooming & professional conduct within an industrial environment 3. Develop the attitude for individual and teamwork				
Sr. No.	Course Contents (Topics and subtopics)			Reqd hrs
1	Students will be sent for factory training in the Textile processing industry and allied sector for 15 weeks. Students are required to submit a Certificate of completion of training from a relevant authority from the industry where they have been sent along with the report of the day-to-day activities at the training place. The students will			15 weeks

	also be required to present the training report orally.	
Course Outcomes (Students will be able to.....)		
CO1	Apply the concept of project & production management in further planning.	K3
CO2	Develop critical thinking regarding the various operations involved in textile industry.	K4
CO3	Solve certain industrial challenges in textile processing.	K5
CO4	Present and communicate an industrial problem effectively.	K5
CO5	Write a scientific report on the training.	K5

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	3	3	3	3	3	3	2
CO2	3	3	2	3	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	2	3	1	3	2	3
CO4	3	3	2	3	3	3	3	0	3	3	3	3
CO5	3	3	3	3	1	3	3	3	3	2	3	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	2	2	3
CO3	3	3	3	3
CO4	2	3	3	2
CO5	3	3	2	2

Semester: III

Course Code: TXT2218	Course Title: Theory of dyeing	Credits = 2		
		L	T	P
Semester: III	Total contact hours: 30	1	1	0
List of Prerequisite Courses				
Chemistry of intermediates and dyes (TXT2703), Physicochemical aspects of coloration (TXT2216)				
List of Courses where this course will be prerequisite				

Textile testing and evaluation (TXT2305), Analysis and application of auxiliaries and colorants (TXP2023)		
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program		
Provide in-depth knowledge of the chemistry and mechanism of natural and synthetic colourants, dye-fibre interaction from the point of view of uniform dyeing with desirable depths and tone. Physicochemical aspects of dyeing and the expectations of textile consumer in terms of colour fastness properties.		
Sr.No	Course contents (topics/subtopics)	Reqd Hrs
1.	Perception of colour, Major characteristics of dyes and pigments, Classification of colouring matters according to their application to the textile fibres, Colour Index, Nomenclature of commercial dyes, Molecular structures of dyes, Dye standardisation, Dye Selection, Fastness properties, standard depth concept, evaluation of fastness properties of dyed materials and their acceptability limits, Important properties of dyestuffs and their evaluation.	7
2.	Common terms used in textile wet processing; substantivity and affinity, % shade, % exhaustion, % expression, MLR, standing bath, cross dyeing, reserve dyeing, tailing effect, stripping etc., Dyeing assistants, mechanism for exhausting agents, levelling agents.	4
3.	Mechanism of dyeing, Dye fibre interactions, General theory of dyeing. Brief introduction to dyeing of different dyestuffs onto various natural and synthetic textile fibres.	3
4.	Thermodynamics of dyeing process; Kinetics of dyeing; Affinity of dyes towards the fibres; Adsorption isotherms; Equilibrium adsorption and factors influencing the same; Saturation value; Diffusion coefficient; Glass transition temperature and its effect on dyeability; Electro-kinetic properties of dye-fibre systems.	7
5.	Compatibility of dyes in mixtures; Dyeing of fibre blends and shade matching. Novel dyeing techniques, Theories behind different techniques such as, Rapid dyeing concept solvent dyeing, mass colouration, heat transfer coloration, etc.	7
6.	Concept of eco-friendliness in dyestuffs and dyeing techniques.	2
Total		30
List of Textbooks/ Reference Books		
1.	Textile Chemistry, Peters R.H, Vol-3, Elsevier Publishing Company, London, 1975	
2.	Chemical Processing of Synthetic Fibres and Blends, Datye K.V. and Vaidya A.A., John Wiley and Sons, New York, 1984	

3.	Theory of Colouration of Textiles, Johnson A., SDC Publ., Bradford, 2nd edition, 1989	
4.	Handbook of textile and industrial dyeing, Clark M., Woodhead Publishing Limited, 2011	
5.	Physico-Chemical Aspects of Textile Colouration, Burkinshaw S.M., Wiley, 2016	
Course Outcomes (students will be able to.....)		
CO1	Comprehend fundamentals of fibres and colour science in relation to dyeing.	K2
CO2	Describe basic physicochemical aspects of dyeing on fibres.	K3
CO3	Write, compile, and elaborate on dyeing procedures.	K2
CO4	Apply different dyeing techniques and compare them.	K4
CO5	Correlate the theory and procedures of dyeing.	K3

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	0	3	3	3	3	3	3	2
CO2	3	2	2	0	3	3	3	0	2	3	2	0
CO3	3	2	1	2	1	2	2	2	3	3	3	1
CO4	3	1	2	2	2	3	1	3	2	1	3	2
CO5	3	2	1	3	2	3	3	3	2	3	3	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	3	3	2	2
CO3	2	2	1	0
CO4	3	3	2	1
CO5	3	3	1	1

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2217	Course Title: Physicochemical aspects of finishing	Credits = 4		
		L	T	P
Semester: III	Total contact hours: 60	3	1	0

List of Prerequisite Courses		
Chemistry of textile auxiliaries (TXT2206), Textile chemicals and fibre analysis (TXP2025)		
List of Courses where this course will be prerequisite		
Textile testing and evaluation (TXT2305)		
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program		
This course will help students understand effect of various mechanical and chemical finishes in terms of imparting desired functionality to meet the end use application.		
Sr No	Course contents (topics/subtopics)	Reqd Hrs
1.	Object of finishing, classification of finishes	8
2.	Mechanical finishes of natural, synthetic and blended fabrics like calendaring, raising, crabbing, potting, compacting, sanforising, pressing, decatizing etc.	10
3.	Chemical finishing agents like stiffeners, binders, weighting agents, softeners, optical brighteners, hand building agents	10
4.	Chemistry and technology used for improving wrinkle resistance, wash ad wear, and durable press properties of fabrics, non-formaldehyde finishes, technologies for resin finishing – dry, moist and wet cross-linking	8
5.	Repellent finishes – mechanism, chemistry and evaluation	6
6.	Functional finishes like antibacterial, flame retardant, water/oil repellent, soil release, antistatic, moisture management, UV protection, biological finishes and its mechanism, chemistry and evaluation	10
7.	Concept of conservation of chemicals, water, energy through different techniques and machineries, eco – friendliness of various finishes.	8
Total		60
List of Textbooks/ Reference Books		
1.	Handbook of fiber finish technology, Slade, P.E.; Mrcel, New York, 1998	
2.	Textile finishing, Hall A. J.; Heywood book, London, 1966	
3.	An introduction to textile finishing, Marsh, J.T.; B.I. Publication, Bombay 1979	
4.	Technology of finishing, V. A. Shenai, Vol 10, Sevak publication, Bombay, 1990	
5.	Low liquor dyeing and finishing, textile institute, Manchester	
Course Outcomes (students will be able to.....)		
CO1	Comprehend different methods and machineries available for application of finish	K2

	and calculation for finish add-on onto the fabric.	
CO2	Describe different types of softeners, fastness improving agents, antimicrobial, antistatic, flame retarding agents, their chemistry, application on fabric and tests to evaluate it.	K2
CO3	Outline different types of enzymes, cross linking agents based on formaldehyde free, their chemistry, application on fabric and tests to evaluate it.	K3
CO4	Analyze processes and their control systems to enhance efficiency of drying and heat setting for various types of textile material and fabrics.	K4
CO5	Demonstrate different methods for assessment and durability of finishes.	K3

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	3	3	3	3	3	3	2
CO2	3	2	2	2	2	0	3	2	2	3	3	1
CO3	3	2	3	3	3	3	2	3	3	0	2	3
CO4	3	3	2	1	2	3	3	2	1	3	1	2
CO5	3	3	2	3	2	3	3	2	3	3	2	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	2	2
CO3	3	2	2	3
CO4	2	3	2	2
CO5	3	3	1	1

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2210	Course Title: Textile wet processing machinery	Credits = 2		
		L	T	P
Semester: III	Total contact hours: 30	1	1	0
List of Prerequisite Courses				
Chemistry of natural and manmade fibres (TXT2106), Textile chemicals and fibres analysis (TXP2025)				
List of Courses where this course will be prerequisite				
Professional Career and future academic research				

Description of relevance of this course in the M.Sc. (Textile Chemistry) Program		
Students will better understand various stages of textile wet processing, and types of machinery used and gain a basic idea about wet processing operations.		
Sr. No.	Course Contents (Topics and subtopics)	Reqd. hrs
1.	Earlier developments in processes and machinery for dyeing of textiles in various forms such as loose fibres, yarns as well as woven and knitted fabrics	4
2.	Batch type, semi-continuous and continuous type of processing machinery for pre-treatment of all forms of textiles.	6
3.	Dosing systems for dyeing, automatic colour and chemical dispensing systems, automated inventory management systems for dyes and chemicals	5
4.	Printing machines for textiles	3
5.	Finishing machines for textiles	2
6.	Machinery used for washing and soaping	2
7.	Developments in machinery for wet processing	4
8.	Concept of conservation of utilities	2
9.	Effluent treatment plant organization in textile	2
List of Textbooks/ Reference Books		
1	Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar, 1999	
2	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol.3, 3rd edition, 2003.	
3	Technology of Dyeing, Shenai V.A., Vol. 6, Sevak Publication, Bombay, 1994.	
4	Technology of Printing, V. A. Shenai, Sevak Publications, Bombay, Vol. 4, 1990.	
5	Technology of Bleaching and Dyeing, Chakraverty, R.R., Trivedi S.S., Vol. 1, Mahajan	
6	Textile Printing by L. W. C. Miles, revised second edition published by SDC, 2003.	
7	Technology of Finishing, Shenai V.A., Vol. 10, Sevak Publication, Bombay, 1990.	
8	Principles of Textile Finishing, Choudhury A. R, Woodhead Publishing, 2017	
Course Outcomes (students will be able to.....)		
CO1	Justify the improvisation in the textile processing machinery according to the efficiency and ease of operation.	K2
CO2	Examine the various parts and segments of textile processing machinery and differentiate them according to their functions.	K3
CO3	Demonstrate the new developments in textile processing types of machinery with respect to their utility.	K3
CO4	Design processing machinery setup and effluent treatment plant according to the prerequisites.	K3

CO5	Explain effluent treatment procedures and their application to textile processing wastewater.	K2
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Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	0	0	1	1	2	3
CO2	3	2	3	2	3	1	1	1	0	1	2	2
CO3	3	2	2	3	2	2	1	1	1	2	2	3
CO4	3	2	2	3	2	1	1	2	1	1	2	2
CO5	3	2	2	2	2	2	3	3	1	1	2	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	3	2	3	1
CO3	3	2	1	1
CO4	3	3	2	1
CO5	3	3	1	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2028	Course Title: Finishing of textiles and fastness testing	Credits = 4		
		L	T	P
Semester: III	Total contact hours: 60	0	0	8
List of Prerequisite Courses				
Physicochemical aspects of finishing (TXT2217), Textile chemicals and fibre analysis (TXP2025)				
List of Courses where this course will be prerequisite				
Textile testing and evaluation (TXT2305)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
This will help students to understand the properties of textile substrate used in different applications.				

Sr No	Course contents (topics/subtopics)	Reqd Hrs
1.	Objective and requirement of finishing, machinery used, mechanical operations involved, methods of finish evaluation	2
2.	Application of softeners of varying ionic nature– Cationic, Anionic, Nonionic, Amphoteric, and different physical aspects – flakes, paste, liquid – evaluation of finished fabric for its feel, effect on absorbency, yellowing	4
3.	Finishing of cotton and Polyester using Silicone softeners of varying particle size – Macro, Micro, Nano (particle size analysis) and performance effect – amino, amido, quaternary to evaluate effect on hand feel and absorbency.	4
4.	Application of Elastomeric finish on cotton and polyester fabric – evaluation of hand feel, bulk/bounce, stretch and elastic recovery	2
5.	Application of stiffener and weight-gain agents on cotton woven– Starch, PVA. Evaluation in terms of hand feel, drape, bending length, tear strength	4
6.	Application of antistatic on polyester and hydrophilic on terry towel - testing of finished fabric for static charge, absorbency, wicking property, water retention	4
7.	Application of Anti-pilling agent on polyester cotton and polyester Viscose blend - testing of pilling behavior by Martindale	2
8.	Application of flame retarding agent and testing of finished fabric by measurement of char length, rate of burning and Limiting Oxygen Index.	4
9.	Application Resin cross linking agent and testing of finished fabric for crease recovery angle, tear strength, bending length	4
10.	Application of Oil and water repellent and evaluation of fabric for water repellency by spray/shower test and water penetration test and oil repellency by spotting.	4
11.	Application of colour enhancer on Navy and Red dyed Cotton and Polyester fabric – evaluate depth enhancement, shade change, hand-feel	2
12.	Application of Rub fastness improver on Navy and Red dyed Cotton and Polyester fabric – evaluate rubbing fastness, shade change, hand feel	4
13.	Application of soil release agent and testing of finished fabric for anti-soiling property, stain spotting and wash off behaviour	4
14.	Application of Aroma and microencapsulated fragrance finish – Mint, Lavender, Rose, Vanilla – evaluation of fragrance release by rubbing	4
15.	One step dyeing and finishing on cotton, polyester and P/C blend fabric by pad-dry-cure method	4

16.	Determination of colour fastness to various agencies like washing, light and rubbing.	2
17.	Determination of colour fastness to perspiration, sublimation and hot pressing, Bleach with hypochlorite and peroxide.	2
18.	Determination of the Fabric strength and elongation at break, bursting strength of a fabrics, abrasion resistance of a fabrics, Tear strength of a fabrics .	2
19.	Determination of pilling resistance of fabric, Seam strength and Yarn Slippage, Stitch strength.	2
Total		60

List of Textbooks/ Reference Books

1.	Textile Finishing, Hall A.J., Heywood book, London, 1966.
2.	An Introduction to Textile Finishing, Marsh J.T., B.I. Publication, Bombay, 1979.
3.	Technology of Finishing, Shenai V.A., Vol. 10, Sevak Publication, Bombay, 1990.
4.	Handbook of Fibre Finish Technology, Slade, P.E., Marcel, New York, 1998.
5.	Encyclopedia of Textile Finishing, Rouette, H.K., Springer Verlag, New York, 2001.

Course Outcomes (students will be able to.....)

CO1	Carry out the application of conventional textile finishing agents.	K3
CO2	Evaluate various finish parameters and testing procedure.	K3
CO3	Perform application techniques for specialty functional finishes.	K3
CO4	Evaluate the effect of finishing on the comfort feel properties of textile.	K4
CO5	Formulate compatible mixture recipes for intended end use application.	K5

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	3	2	1	1	2	3
CO2	3	3	3	3	2	2	2	1	1	2	3	3
CO3	3	2	2	3	2	3	2	1	1	1	2	2
CO4	2	2	3	3	3	2	2	1	1	1	1	2
CO5	2	3	3	3	2	1	2	1	1	2	2	2

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	2	2	2
CO3	2	3	3	2
CO4	2	2	2	1
CO5	3	3	1	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2020	Course Title: Project I Literature survey, project plan, and proof of concept	Credits = 4		
		L	T	P
Semester: III	Total Contact Hours: 80	0	0	8
List of Prerequisite Courses				
Chemistry of natural and man-made fibres (TXT2106), Chemistry of intermediates and dyes (TXT2703), Physicochemical aspects of coloration (TXT2216), Physicochemical aspects of finishing (TXT2217)				
List of Courses where this course will be prerequisite				
Project II (TXP2022)				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
Teachers will communicate various research project topics to all the students based on interest and facilities available and relevance to the area of Textile Processing Technology and allied areas.				
Sr. No.	Course Contents (Topics and subtopics)			Reqd hrs
1	Students will be required to make a detailed literature search of the proposed area to be undertaken under the guidance of the research supervisor. In general, a written review report along with his proposed plan of research work emanating from it needs to be submitted in the form of a standard typed report. The student will also be required to perform preliminary experiments to achieve proof of concept			80
Course Outcomes (Students will be able to.....)				
CO1	Develop critical thinking to identify the research gap for the project.			K5
CO2	Formulate a scientific question and approach to solve it.			K6
CO3	Plan the experimental methodology for the project.			K5
CO4	Develop skills to communicate the research plan effectively.			K6
CO5	Develop skills for writing a scientific document on the research work.			K6

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	2	3	3	3
CO2	3	3	3	3	3	3	3	3	2	1	2	3
CO3	3	3	3	3	3	3	3	3	2	1	2	3
CO4	3	2	2	3	3	3	3	3	2	3	2	3
CO5	2	3	3	3	3	2	2	3	1	1	2	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	3	3	3	3
CO3	2	2	2	1
CO4	2	2	3	2
CO5	1	2	2	1

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Semester IV

Course Code: TXT2305	Course Title: Textile testing and evaluation	Credits = 4		
		L	T	P
Semester: IV	Total contact hours: 60	3	1	0
List of Prerequisite Courses				
Physicochemical aspects of coloration (TXT2216), Physicochemical aspects of finishing (TXT2217), Pretreatment of Textiles (TXT2207), Textile Wet processing machinery (TXT2210)				
List of Courses where this course will be prerequisite				
Professional Career and future academic research				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
This course will help students to understand and apply different analytical methods for testing textile, measurement of colour fastness and assessment of performance properties of textile.				
Sr. No.	Course contents (topics/subtopics)	Reqd. hrs		

1.	Objective of testing; Introduction to textile testing, Selection of samples for testing, Random and biased samples, Testing of raw materials and finished products.	5
2.	Analytical (Advanced) equipments and their role in Textile analysis, Identification, and testing of fibres by different methods like density, burning behavior, stain test, melting point, dissolution test etc	4
3.	Need for testing, Various testing standards such as BIS, AATCC, ISO along with their format for measurement and reporting of colour fastness to various agencies, standard depth of shade	16
4.	Tensile testing of fibres, yarns and fabrics. Tearing, bursting, Pilling and abrasion resistance tests for fabrics. Bending, shear and compressional properties of fabrics. Fabric drape and handle. Crease and wrinkle behavior. Air, water and water-vapour transmission through fabrics. Thermal resistance of fabrics. Testing of interlaced and textured yarns.	16
5.	Flame retardancy, antimicrobial, Hydrophilic and hydrophobic testing of fabrics along with special tests for carpets.	8
6.	Ecotesting of textiles	2
7.	Evaluation of colour fastness properties, Testing of lycra blended fabric material	4
8.	Norms of global standards for textile production and use, e.g. care labels, eco labels,	5
List of Textbooks/ Reference Books		
1.	Textile Analysis, Trotman E.R., Trotman S.R., Charles Griffin and Co., London, 1932.	
2.	Principles of Textile Testing: An introduction to Physical methods and Testing textile fibres, yarn and fabric, Booth J.E., Heywood Books, London, 3rd edition, 1968.	
3.	Microscopic and Chemical Testing of Textiles, Koch, P.H., Chapman and Hall, London, 1963	
4.	Physical Properties of Textile Fibres, Morton, W.E. and Hearle, J.W.S., Textile Institute, Manchester, 2nd edition, 1975.	
5.	Society of Dyers and Colourists: standard methods for the determination of the colour fastness of Textiles and Leather.1980	
6.	Handbook of Textile Testing and Quality Control, Grover, B. and Hemby, P.S., Wiley Eastern Ltd., New Delhi, 2nd edition, 1988.	
7.	Textile Testing and Analysis, Collier, B.J. and Hellen H., Upper Saddle River: Pentice Hall Inc., 1999.	
8.	Principles of Textile Testing, 3e (PB) India: CBS Publishers and Distributors, 1996	
9.	Saville, B. P. Physical Testing of Textiles. United Kingdom: Elsevier Science, 1999	
10.	Raul, J. Textile Testing. India: APH Publishing Corporation, 2005	
11.	Izquierdo, V., Vermeersch, O., Dolez, P. I. Advanced Characterization and Testing of Textiles. United Kingdom: Elsevier Science, 2017	

Course Outcomes (students will be able to.....)		
CO1	Comprehend the objects of testing and its reasons and stages at which testing is to be done.	K2
CO2	Analyze different physical testing performed on the fibres, yarn, and fabric for their mechanical, aesthetic and performance behaviour.	K3
CO3	Interpret and examine different fastness tests of the coloured goods.	K4
CO4	Identify different testing standards and their importance.	K3
CO5	Understand testing principles and operation of different analytical testing instruments.	K2

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	2	2	1	2	2	3
CO2	3	2	3	2	2	1	2	1	1	2	2	3
CO3	3	2	3	2	2	1	2	1	1	2	2	3
CO4	3	2	3	2	2	1	2	1	1	2	2	3
CO5	3	2	3	1	3	2	1	2	3	2	2	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	3	3	3	3
CO3	3	3	2	2
CO4	2	2	2	3
CO5	2	2	2	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXT2306	Course Title: Certifications in textile value chain	Credits = 4		
Semester: IV		L	T	P
Total contact hours: 60		3	1	0
List of Prerequisite Courses				
Physicochemical aspects of coloration (TXT2216), Physicochemical aspects of finishing (TXT2217), Chemistry of textile auxiliaries (TXT2206), Textile chemicals and fibre analysis (TXP2025)				
List of Courses where this course will be prerequisite				

Professional Career and future academic research		
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program		
This course is required for the future professional career. The course will help student to understand eco-balance in the textile products and their requirements.		
Sr no.	Course Contents (Topics and subtopics)	Reqd . hrs
1.	Textile Exchange Certification-GOTS, OCS, RCS, OCS, RAS, RWS, RDS, EU flower, Nordic Swan	10
2.	Concept of Chemical Management (CM) and its importance in Textiles Preparation of Safety Data Sheet and its interpretation	3
3.	Better cotton initiative (BCI), Fair Trade Cotton, Egyptian cotton	3
4.	Oeko tex-Standard 100, Sustainable textile Production (STeP), Made in Green, Clean By Design-Apparel Impact Institute, Other compliance-Bluesign	10
5.	Zero Discharge of Hazardous Chemicals (ZDHC)-Supplier to zero, brands to zero, wastewater sampling, Detox to zero, Incheck, Chemchek, ZDHC-MRSL and RSL	6
6.	REACH Certification-Registration, Evaluation, Authorization and Restriction of chemicals	6
7.	Leadership in energy and environmental design (LEED)	2
8.	Fair Wear foundation, Leather Working Group (LWG), Alliance for responsible denim, Sustainable Fibre alliance	4
9.	Cradle to cradle certification, ISO certification:9001-QMS,14001-EMS,45001-OHSAS.	4
10.	Environment Audit program-Higg Facility Environment Module, Amfori BEPI-Environment & chemical audit, Security Audit-Customs Trade Partnership against Terrorism (CT-PAT), Technical Audits- SQP, Product safety audit programs based on client requirement	6
11.	Social Certification-FSLM, WRAP, BSCI, SEDEX-SMETA, SA8000, Client -code of conduct audits, Ethical trading initiative, International Labor organization standard, Forest stewardship council (FSC) certification	6
List of Textbooks/ Reference Books		
1.	Textile Exchange: Accreditation and Certification Procedures for Textile Exchange Standards 2.0	
2.	Roadmap to Sustainable Textiles and Clothing, Subramanian Senthilkannan Muthu, Springer Science, 2014.	
3.	Ecology and textiles, V. A. Shenai, Sevak publication	
4.	Textile effluent, Padma Vankar, Ncute publication	
5.	Handbook of chemical and environmental engineering calculations, J.P. Reynolds, John S. Jeris, Louis Theore	
6.	Environmental chemistry, John Wright	
Course Outcomes (students will be able to.....)		
CO1	Understand the concept of Chemical Management and its importance, different global regulations, and testing protocols of the hazardous chemicals.	K2
CO2	Interpret and preparation of safety data sheet of the chemicals.	K3
CO3	Identify hazardous chemical, RSL and MRSL substances in the Textile value	K3

	chain.	
CO4	Evaluate different auditing systems used for textile field.	K3
CO5	Evaluate various certifications used in textile industries	K3

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1	2	1	3	2	3	3	3
CO2	2	2	1	1	3	2	3	2	0	0	1	2
CO3	3	2	2	2	3	3	3	3	1	1	1	3
CO4	3	2	2	3	3	2	3	3	2	3	3	3
CO5	3	3	2	2	2	3	3	3	2	3	2	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	2	3	2	3
CO3	3	2	2	3
CO4	2	2	1	3
CO5	3	2	2	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2023	Course Title: Analysis and application of auxiliaries and colorants	Credits = 2		
		L	T	P
Semester: IV	Total Contact Hours: 60 Hours	0	0	4
List of Prerequisite Courses				
Physicochemical aspects of coloration (TXT2216), Physicochemical aspects of finishing (TXT2217), Pretreatment of Textiles (TXT2207), Chemistry of textile auxiliaries (TXT2206)				
List of Courses where this course will be prerequisite				
Professional Career and future academic research				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
It will provide scientific background to students which will help them to understand relation between fibres and auxiliaries and colorants.				
Sr. No.	Course Contents (Topics and subtopics)			Reqd hrs
1.	Analysis of given water-soluble dye sample – appearance, pH (1%), solubility (water, salt, alkali), O.D. against std., TLC, paper chromatography - direct and			4

	reactive dyes	
2.	Analysis of given disperse dye sample – appearance, pH (1%), dispersion stability (electrolyte, with and without dispersing agent), O.D. against std., TLC, paper chromatography, filter test for disperse and vat dyes	4
3.	To test given pigment dispersion for appearance, pH, solid content	4
4.	Substantivity, primary and secondary exhaustion, build-up study	4
5.	Identification of dye on fiber	4
6.	Determination of colour fastness to various agencies like washing, light and rubbing	4
7.	Determination of colour fastness to perspiration and bleaching agents	4
8.	Determination of colour fastness to sublimation and hot pressing.	4
9.	To test given sample of textile auxiliary for appearance, pH, solid content, solubility, ionic nature, specific gravity, viscosity, cloud point determination, surface tension determination, chelation value, active content of anionics	4
10.	Testing of wetting agent – wetting and foaming; mercerization shrinkage test	4
11.	Testing of desizing agent, Testing of hydrogen peroxide stabilizer and killer	4
12.	Testing of levelling and dispersing agent – disperse, reactive	4
13.	Testing of dye fixing agent, Testin of washing off agent	4
14.	Qualitative and quantitative analysis of printing binders	4
15.	Determination of Amylase, catalase and cellulase activity	4
Course Outcomes (Students will be able to.....)		
CO1	Analyze various properties of dyes.	K3
CO2	Evaluate various properties of auxiliaries and specialty chemicals used in textile processing.	K4
CO3	Assess qualitative and quantitative analysis of auxiliaries and specialty chemicals.	K3
CO4	Evaluate performance properties of processed fabric.	K3
CO5	Analyze the various chemical performance criteria.	K3

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	2	1	1	1	2	2	3
CO2	3	3	2	2	2	2	2	2	1	1	1	3
CO3	3	3	3	3	3	2	2	0	0	0	2	3
CO4	3	3	2	3	2	2	1	2	2	1	3	3
CO5	3	3	2	3	3	2	3	1	2	1	2	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)												
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	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	2	3	2	2
CO3	3	3	2	2
CO4	3	2	3	3
CO5	3	2	3	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain

Course Code: TXP2022	Course Title: Project II	Credits = 6		
		L	T	P
Semester: IV	Total Contact Hours: 120 Hours	0	0	12
List of Prerequisite Courses				
All Technology Courses in previous semesters.				
List of Courses where this course will be prerequisite				
Professional Career and future academic research				
Description of relevance of this course in the M.Sc. (Textile Chemistry) Program				
Teachers will communicate various research project topics to all the students based on interest and facilities available and relevance to the area of Textile Processing Technology and allied areas.				
Sr. No.	Course Contents (Topics and subtopics)			Reqd hrs
1	This would be concerned with the continuation of the research project executed in the third semester and the exact work plan will be decided in consultation with the research guide. At the end of the project, the candidate is expected to submit a report which will be evaluated by the research guide and an external examiner from the Department/Industry based on the presentation made by the candidate. A suitable combination of the marks for report and presentation will be considered for the final evaluation.			120 Hrs
Course Outcomes (Students will be able to.....)				
CO1	Develop critical thinking to identify the research gap for the project			K5
CO2	Formulate a scientific question and approach to solve it			K6
CO4	Plan the experimental methodology for the project			K5
CO5	Develop skills to communicate the research plan effectively			K6
CO6	Develop skills for writing a scientific document on the research work			K6

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	3	3	3	2	3	3

CO2	3	3	3	3	3	1	1	3	2	1	2	3
CO3	3	3	3	3	3	2	3	1	1	1	2	3
CO4	3	3	3	2	2	2	1	2	1	2	3	3
CO5	3	3	2	2	1	2	1	2	1	2	3	3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)				
	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	3	3	2	3
CO3	3	2	2	2
CO4	2	1	2	2
CO5	3	2	2	2

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; 0, No Contribution
 K, Knowledge-level from cognitive domain; A, Affective domain; P, Psychomotor domain