



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI03028011

Course / Subject Name : Textile Organic Chemicals

<b>w. e. f. Academic Year:</b>	2024-25
<b>Semester:</b>	3 <sup>rd</sup>
<b>Category of the Course:</b>	ESC

<b>Prerequisite:</b>	A foundational understanding of textile organic chemistry requires prior knowledge in basic chemistry. Students should be familiar with various fundamentals, principles, and theories involved in chemistry. Additionally, fundamental concepts of basic chemistry will aid in the understanding of textile organic chemistry. Familiarity with basic chemical & their properties, terminologies and preparation will also be required, enabling students to contextualize their learning within the broader textile wet processing industry.
<b>Rationale:</b>	The course provides the basic knowledge of textile organic compounds and their properties, and applications. The study of textile organic chemistry allows engineers to get the most out of raw materials in creating textile processing like scouring, bleaching, dyeing, printing, finishing etc. needed in the wide variety of engineering and technological application in the field of textile industries. The deep understanding of various topics/subtopics of textile organic chemistry would enable the diploma engineers to the various engineering problems, developments and breakthrough in textile processing engineering and technology in a very systematic and scientific way.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Apply concept of organic chemistry aspects.	R + A
02	Suggest carbon structure with its chemical properties and compounds.	U + A
03	Choose unit process based on requirement of textile organic chemicals.	R + U + A
04	Use relevant purification methods in textile industries.	R + U + A
05	Estimate elements present in textile organic chemicals.	R + U + A

\*Revised Bloom's Taxonomy (RBT)



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## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA (M)	PA(I)	ESE (V)	
2	0	2	3	70	30	20	30	150

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<b><u>Fundamentals of Textile Organic Chemistry</u></b> 1.1 Organic compounds 1.1.1 Classification organic compounds 1.2 Hydrocarbons 1.2.1 Classification of hydrocarbons 1.2.2 Difference between aliphatic and aromatic hydrocarbons 1.3 Classification of organic textile chemicals 1.4 IUPAC system of nomenclature of organic compounds 1.5 Isomerism: 1.5.1 Structural isomerism 1.5.1.1 Chain isomerism 1.5.1.2 Position isomerism 1.5.1.3 Functional group isomerism 1.5.1.4 Metamerism, Tautomerism 1.5.2 Stereo isomerism 1.5.2.1 Geometrical isomerism 1.5.2.2 Optical Isomerism	05	15
2.	<b><u>Carbon and its Compounds</u></b> 2.1. Nature of carbon 2.1.1 Saturated carbon compounds 2.1.2 Unsaturated carbon compounds 2.2. Chemical properties of carbon 2.2.1 Combustion 2.2.2 Oxidation	05	20



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	2.2.3 Addition reaction 2.2.4 Substitution reaction		
3.	<b><u>Unit processes</u></b> 3.1 Unit processes 3.1.1 Classification 3.1.2 Application of unit processes 3.2 Brief study of unit processes 3.2.1 Nitration 3.2.2 Sulphonation 3.2.3 Halogenation 3.2.4 Alkylation 3.2.5 Diazotisation	06	20
4.	<b><u>Methods of Purification of Textile Organic Chemicals</u></b> 4.1 Crystallization 4.2 Sublimation 4.3 Distillation 4.3.1 Simple distillation 4.3.2 Fractional distillation 4.3.3 Vacuum distillation 4.3.4 Steam distillation 4.4 Chromatography 4.4.1 Column chromatography 4.4.2 Paper chromatography 4.4.3 Thin layer chromatography 4.5 Melting point 4.6 Boiling point	08	25
5.	<b><u>Estimation of Textile Organic Chemicals</u></b> 5.1 Qualitative Estimation 5.1.1 Detection of carbon and hydrogen 5.1.2 Detection of other elements 5.1.2.1 Lassaigne's test for nitrogen, sulfur, halogens, and phosphorus 5.2 Quantitative Estimation 5.2.1 Estimation of carbon and hydrogen 5.2.2 Estimation of nitrogen (Dumas and Kjeldahl's method) 5.2.3 Estimation of halogen and sulfur (Carius method)	06	20
	<b>Total</b>	<b>30</b>	<b>100</b>



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## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
30	35	35	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources:

### (a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	A Textbook of organic chemistry	S.Chand & Co.	S.Chand Publication, New Delhi, 2019, ISBN-9789352837304
2	Synthetic organic textile chemicals (Volume VII)	Dr V. A. Shenai	Sevak Publication, 1980
3	Organic Chemistry (Pearson 7th Edition)	R.T.Morrison, R.N.Boyd and S.K.Bhattacharjee	Pearson Education, India, 2010 ISBN:978-8131704813
4	Vogels' Textbook of practical organic chemistry (5th edition)	B.S.Furniss, A.J.Hannaford, P.W.G.Smith, A.R.Tatchell	Pearson Education India, 2003 ISBN: 978-8177589573
5	Textbook of Organic Chemistry	P.L.Soni & H.M.Chawla	S.Chand & Sons Publication, 2012, ISBN: 978-8180547676

### (b) Open source software and website:

- <https://organicchemistrydata.org/links/>
- <https://www.coursera.org/>
- [http://ocw.uci.edu/collections/open\\_chemistry.html](http://ocw.uci.edu/collections/open_chemistry.html)
- <http://chemcollective.org/>
- <http://www.olabs.edu.in/>
- <https://nptel.ac.in/courses/116/104/116104046/>
- <https://www.science.gov/>
- <https://fsffrance.org/science/chimie.en.html>
- <https://www.organic-chemistry.org/>



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- k) [https://en.wikibooks.org/wiki/Organic\\_Chemistry](https://en.wikibooks.org/wiki/Organic_Chemistry)  
l) <https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm>  
m) <http://www.digitalbookindex.org/search/search010chemorganica.asp>

## Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Identifying different types of hydrocarbons by combustion and substitution reaction.	II	06
2	Prepare nitrobenzene from benzene.	III	04
3	Prepare two azo dyes (given in laboratory)	III	04
4	Purify the given textile organic compound using crystallization method	IV	02
5	Purify the given textile organic compound using distillation method	IV	02
6	Purify the given textile organic compound using sublimation method	IV	02
7	Determine the melting point of the given textile organic compound.	IV	02
8	Determine the boiling point of the given textile organic compound.	IV	02
9	Detect the elements present in the given textile organic compounds by Lassaigne's test	V	04
Total Hours			28

## List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Digital weighing balance: 0.02 gm accuracy (100 gm)	All
2	Distillation assembly	5
3	Beaker: 100 ml, 250 ml, 500 ml	All
4	Measuring Cylinder of capacity 10 ml, 25 ml, 100 ml	All
5	Digital melting and boiling point apparatus	7, 8
6	Hot plate with magnetic stirrer	2-4, 9



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## Suggested Project List:

- 1) **Power-point presentation:** Prepare power-point animation for explaining IUPAC nomenclature system, and isomerism with example.
- 2) **Testing report:** Prepare a testing report for different aliphatic and aromatic textile organic compounds based on their melting and boiling point.
- 3) **Model:** Create a model for demonstrating the application of various distillation processes, crystallization process, and various chromatographic techniques.
- 4) **Unit process:** Prepare list of different unit processing reagent used in industrial unit process for preparation of different textile organic compounds.
- 5) **Estimation:** Prepare qualitative and quantitative estimation report for different textile organic compounds.
- 6) **Carbon:** Enlist various carbon containing textile organic compounds with their properties.

## Suggested Activities for Students:

- 1) Prepare a power point presentation or animation showing different types of isomerism.
- 2) Prepare a table showing the different methods used for purification of textile organic compounds.
- 3) Library survey of different textile organic materials and compare their properties and applications.
- 4) Group discussion and self-learning activities on recent innovation in textile organic chemistry for sustainability and green approach.
- 5) Oral presentation/Webinar/Seminar/Expert lecture related to different unit processes used in industry.
- 6) Prepare a list of do's and don'ts during practical work in laboratories and industries.

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