



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI03028061

Course / Subject Name : Colour Chemistry

w. e. f. Academic Year:	2024-25
Semester:	3 rd
Category of the Course:	PCC

Prerequisite:	A foundational understanding of colour chemistry requires prior knowledge in basic chemistry, physics and application. Students should be familiar with various concepts of physical and chemical phenomenon. Familiarity with basics of colour, terminologies and applications will also be required, enabling students to contextualize their learning within the broader textile wet processing industry.
Rationale:	The polytechnic graduates are required to supervise operations of fibre, yarn and fabric for their dyeing & printing processes in industry. They should have basic knowledge and skills to handle colour identification in dyeing and printing processes. The course on Colour Chemistry have been designed to provide basic knowledge and skills as well as recent technological developments in the area of colour identification, perception, and application. This course also provides concepts of various colour vision theories as well as awareness about the colour vision.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Develop desired colours using colour mixing laws	R + A
02	Use colour vision theories	U + A
03	Correlate colour properties with molecular structure	R + U
04	Apply the concept of metamerism	R + U + A
05	Use colour order systems to quantify and communicate colour	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)	
3	0	0	3	70	30	00	00	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<u>Fundamentals of Colour Chemistry</u> 1.1 Perception of colour 1.1.1 Source of light 1.1.2 Object 1.1.3 Observer 1.2 Colour mixing laws 1.2.1 Additive colour mixing 1.2.2 Subtractive colour mixing 1.3 Confusion in colour perception 1.3.1 After image 1.3.2 Simultaneous contrast	08	20
2.	<u>Physical Basis of Colour</u> 2.1 The eye 2.2 Mechanism of colour vision 2.3 Colour vision theories 2.4 Defects in colour vision 2.5 Colour vision tests 2.6 Awareness about colour vision	08	20
3.	<u>Chemical Basis of Colour</u> 3.1 Colour and molecular structure 3.1.1 Valance bond theory for colour/structure relationship 3.1.2 Molecular orbital theory for colour/structure relationship 3.1.3 Molecular mechanics 3.1.4 QSAR and QSPR 3.2 Colour in inorganic compounds 3.2.1 Colour in metal complexes 3.2.2 Colour from charge transfer transitions	09	20



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4.	<u>Metamerism</u> 4.1 Illuminant metamerism 4.2 Observer metamerism 4.3 Geometrical metamerism 4.4 Metamerism in textiles 4.5 Lamps to detect metamerism	07	15
5.	<u>Scales for Communicating Colours</u> 5.1 Systematic arrangements of colours 5.2 Colour order systems 5.2.1 The necessity of colour order system 5.2.2 Classification 5.2.3 Merits and demerits of colour order systems 5.3 Munsell colour order system 5.4 Natural colour system 5.5 Ostwald system 5.6 DIN system 5.7 OSA-UCS system 5.8 Coloroid system 5.9 Universal colour language (UCL)	13	25
Total		45	100

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	Instrumental colour measurement and computer aided colour matching for textiles	H. S. Shah R. S. Gandhi	Mahajan Book Distributor, 1990 ISBN: 8185401004
2	Colour measurement	Edited by M. L. Gulrajani	Woodhead publishing limited with The Textile Institute, 2010



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Sr. No.	Title of Book	Author	Publication with place, year and ISBN
	Principles, advances and industrial applications		ISBN: 978-1-84569-559-0
3	Colour Chemistry	Robert M. Christie	Royal Society of Chemistry, 2015 ISBN: 978-1-84973-328-1
4	Colour Chemistry	Heinrich Zollinger	Verlag Helvetica Chimica Acta AG and Wiley-VCH GmbH and Co., 2003 ISBN: 3-906390-23-3

(b) Open source software and website:

1. www.nptel.iitm.ac.in
2. <https://ndl.iitkgp.ac.in>
3. www.textileschool.com
4. www.textileguide.chemsec.com
5. www.textileassociationindia.org
6. <https://textilechemrose.blogspot.com>
7. www.textilelearner.blogspot.com
8. www.textileapex.blogspot.com

Suggested Course Practical List: - NIL -

List of Laboratory/Learning Resources Required: - NIL -

Suggested Project List:

- 1) **Colour chemistry:** Prepare a video/presentation for colour perception phenomenon including colour mixing laws and confusion in preception.
- 2) **Eye:** Prepare a model of eye with the addition of showing various colour vision defects and tests.
- 3) **Chemical basis:** Prepare animation for valance bond theory, and molecular orbital theory showing colour variation.
- 4) **QSAR and QSPR:** Prepare flowchart for development of QSAR and QSPR model.
- 5) **Metamersim:** Prepare a sample book of dyed and printed samples which shows metamerism under the different sources, and attach the photos of each sample.
- 6) **Colour order system:** Make a power-point presentation/video/animation for various colour order systems incorporating UCL.



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Suggested Activities for Students:

- 1) Survey market for various colours, and light source.
- 2) Collect information about additive and subtractive colour mixing laws.
- 3) Survey hospital for collecting the data of colour vision defects and tests.
- 4) Collect the information for chemistry involve in valance bond theory and molecular orbital theory from internet, and prepare a note.
- 5) Gather various images from internet related to metamerism.
- 6) Collect the sample photo for various colour order systems.

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