GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3133604
Semester – III
Subject Name: Introduction to colorants

Type of course: Professional Core Course

Prerequisite: Basic knowledge of Chemistry and Technology

Rationale: The main objective of this subject is to study introduction of dyes & pigments their classifications, chemistry of benzenoid and naphthalene aromatics, colour and chemical constitution.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to Dyes:** Definition of Dye or Dyestuff, Requisites of a True Dye, Historical development from natural to synthetic dyes, Important dyestuff intermediates, Nomenclature of dyes intermediates & dyes **Introduction to Textile Fibres:** Fibres & its types such as cotton, wool, silk, cellulose acetate, polyamide, polyester, polyacrylonitrile, polyolefin	**8**
2	**Chemistry of benzenoid aromatics:** Electrophilic aromatic substitution reactions with the mechanisms, one carbon electrophiles & their utility. Nucleophilic aromatic substitution reaction Orientations in aromatic substitution reaction. Hammet substitution constants. Introduction of various functional groups into benzenoid aromatics, functional group inter conversions. Synthesis of typical dyestuff intermediates based on benzene, xylene, toluene.	**8**
3	**Classification of Dyes:** **Classification of Dyes based on application:** Introduction, Direct dyes, Acid dyes, Basic dyes, Developed dyes, Mordant dyes, Vat dyes, Sulpher dyes, Disperse dyes, Reactive dyes **Classification of Dyes based on Chemical Structure:** Nitroso dyes, Nitro dyes, Azo dyes, Diphenylmethane dyes, Triphenylmethane dyes, Xanthene dyes, Heterocyclic Dyes etc.	**8**
4	**Chemistry of Naphthalene-** **Electrophilic aromatic substitution reactions:** Bucherer reaction, Reverse Bucherer reaction. Synthesis of naphthols, naphthylamines,	**8**

	naphthol sulphonic acid, naphthylamine sulphonic acids, amino naphthol sulphonic acids. 8Bon acid arylides as Azocoupling components. Anthracene& condensed aromatics. Anthraquinone & benzanthrone. Reactions of anthraquinone, benzanthrone & synthesis of dyestuff intermediates based onanthraquinone & benzanthrone.	
5	**Introduction to Pigments:** Definitions of pigment, extenders. Practical difference between dyes & pigments, **Classification of pigments**: White pigments, coloured pigments, effect pigments, metal effect pigments, pearl luster pigments etc., General Chemical and Physical Properties & Applications	**8**
6	**Colour & its Chemical Constitution:** Bathochromic & Hypsochromic Effect, Definition and concept of colour, Relationship between colour & chemical constitution, Witt's theory, Armstrong's theory, Baeyer's theory etc., modern theories of colour & constitution	**8**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**30**	**10**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Synthetic Dyes, Dr. G. R. Chatwal, Himalaya Publications, 2009
2. Industrial Inorganic Pigments, Second, G. Buxbaum (Ed.), ISBN 3-527-28878-3, 1998
3. Chemistry of Synthetic Dyes, Lubs H.A., Robert E Krieger Publishing Company NewYork, 1st Ed.,1995
4. Color Chemistry: Syntheses, Properties and Applications of Organic Dyes and Pigments,HeinrichZollinger, Wiley-VCH,2nd Ed, 1991
5. Chemistry of Synthetic Dyes – Vol I, Venkatraman K., Academic Press, New York, 2009
6. Chemistry of Synthetic Dyes – Vol II, Venkatraman K., Academic Press, New York, 2009
7. Chemistry of Synthetic Dyes – Vol III, Venkatraman K., Academic Press, New York, 2009

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3133604

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	To know about dyes and textile fibres.	15
CO-2	To explain the chemistry of dyestuff intermediates based on benzoid aromatics.	15
CO-3	To demonstrates the classification of dyes based on application and chemical structure.	20
CO-4	To illustrate the electrophilic aromatic substitution reactions based on chemistry of naphthalene.	15
CO-5	To describes about pigment and its classification.	20
CO-6	To explain the colour and its constitution.	15

List of Open Source Software/learning website:

1. Chemical weekly
2. Dyes and pigment journal
3. Scifinder online
4. Science direct
5. espacenet
6. Delnet