GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)
ANALYSIS, APPLICATIONS, HEALTH AND SAFETY ASPECTS OF DYES & PIGMENTS
SUBJECT CODE: 2183609
B.E. 8TH SEMESTER

Type of Course: Chemical Technology

Prerequisite: Studied subjects of previous semesters. Basic Knowledge of Analysis, Applications, Health and Safety Aspects of Dyes & Pigments.

Rationale: The main objective of this subject is to study the Analysis, Applications, Health and Safety Aspects of Dyes & Pigments Technology in chemical industries. This subject provides fundamental knowledge of various types of Analysis, Applications, Health and Safety Aspects of Dyes & Pigments and which is applicable in chemical industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	3	7	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1	**Analysis of Pigments:** Crystal structure, particle size, shape and distribution, refractive index and hiding power, oil absorption, specific gravity, bulking value, reducing power, tinting strength, fastness properties such as resistance to light, heat, water, chemicals, bleeding etc. corrosion resistance, toxicity of pigments etc.	10	26
2	**Analysis of Dyes & Inter-mediates:** Colour fastness, Light fastness, sublimation fastness, Paper Chromatography, Thin Layer Chromatography, Column Chromatography, Colour Matching Spectrophotometer, UV-visible Spectrophotometer	10	26
3	**Applications for Pigments:** Paints, Oxidatively Dried Coatings, Baked Enamels, Aqueous Dispersions of Synthetic Resins, Printing Inks, and Pigments for Plastics.	08	16
4	**Applications for Dyes:** Textile Dyeing; Hydro phohic fibers, Polyamide fibers, Polyacrylonitrile (PAC) fibers, Textile Printing;	08	16

	Direct Printing.		
5	**Health and Safety Aspects:** Introduction, Toxicology and Toxicity Assessments; Acute Toxicity, Sensitization, Mutagenicity, Carcinogenicity, Metabolism of Dyes.	08	16

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
29	**23**	**28**	**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.

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1. Formulation Technology: Emulsions, Suspensions, Solid Forms by Hans Mollet, Arnold Grubenmann copyright0 WILEY-VCH Verlag GmbH, 2001.

2. Industrial Dyes: Chemistry, Properties, Applications
   Klaus Hunger- WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

3. Chemistry of Synthetic Dyes
   Lubs H.A. - Robert E Krieger Publishing Company New York - 1st Ed., 1995

4. Chemistry of Synthetic Dyes – Vol I, Venkatraman K. - Academic Press, New York.

Course Outcomes:

1. To get an introductory knowledge of analysis & applications of dyes & pigments.
2. To know the various properties, applications & health aspects of dyes & pigments.
3. To be able to apply this knowledge in Dyes, Pigments & Paints industries
4. To build a bridge between theoretical and practical concept used in industry

List of Experiments:

1.	Identification of given Pigment/Extender
2.	To determine the oil absorption value of Pigment/ Extender.
3	To determine the Bleeding tendency of Pigment/ Extender.
4.	To determine the bulk density of Pigment/ Extender.
5.	Identification of given dye.
6.	To determine the Colour Fastness properties of dye.
7.	To determine the Light Fastness properties of dye.

8.	To determine the Sublimation Fastness properties of dye.
9	To determine the Rf value by using paper chromatography method.
10.	To determine the Rf value by using thin layer chromatography method.
11.	To determine the Rf value by using column chromatography method.
12	To determine colour value by using UV-visible Spectrophotometer.

Open Ended Project fields:-

Students are free to select any area of Engineering & Technology based on chemical technology applications to define Projects.

Some suggested projects are listed below:

1. Literature survey on Environmental issues related to dyes & pigments.
2. To prepare the report on Environmental issues related to dyes & pigments after doing the Industrial visit.
3. PPT on Environmental issues related to dyes & pigments.

List of Open Source Software/learning website:

1. Literature available on internet
2. Dyes and Pigment dictionaries
3. Delnet
4. Literature available under R&D in Dyes, Pigments & Paints industries
5. Dyes & Pigments, Pigments & Resin & Paint India journals

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.