GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3173620
Semester: VII
Technology of Pigments

Type of course: Chemical Technology

Prerequisite: Basic knowledge of Technology pigments

Rationale: The main objective of this subject is to study fundamental knowledge of various types of coloured & high performance pigments and how to carry out manufacturing & applications of these pigments in chemical industries.

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
1	**Colored Pigments-I:** Introduction, properties, methods of manufacturing, properties and composition, quality, after treatment, uses, economic aspects of iron oxide, chromium oxide, mixed metal oxide, cadmium, bismuth pigments	08
2	**Colored Pigments-II:** Introduction, properties, methods of manufacturing, properties and composition, quality, after treatment, uses, economic aspects of, chromate, molybdate and molybdate orange, chrome green, ultramarine blue, prussian blue, phthalocyanine pigment	08
3	**Specialty Pigments:** Introduction, Metallic, Interference and Cholesteric Pigments Aluminium, copper. Nacreous, luminescent (fluoresecent/phosphorescent) pigments-optical principles, substrate free pearlescent pigments. Special effect pigments based on mica (pigments formed by coating of substrates), pigments based on liquid crystal polymer	10
4	**Functional pigments:** Antifouling pigments-cuprous oxide, other copper compounds, mercuric oxide, organotin pigments, variables affecting particle size aggregation and crystal structure. Their use as spacing extenders / functional pigments in paints, reinforcing agent in polymers, heat & wear resistant materials etc.	10
5	**Anticorrosive pigments:** Red lead, basic lead silicochromate, zinc and strontium chromates, white molybdate, calcium plumbate, etc. Passivation mechanism of corrosion resistance	09

Suggested Specification table with Marks (Theory):

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Distribution of Theory Marks					
R level	U level	A level	N level	E level	C level
40	25	15	10	05	05

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

Reference Books:

1. H.M. Smith, High Performance Pigments, Wiley-VCH, 2002.
2. J. Bieleman (Ed.) Additives for Coatings 2000 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim
3. Paul Swaraj, "Surface Coatings – Science and Technology",Wiley Interscience Publishers, John Wiley and Sons, Inc.1986.
4. Lewis, P.A. and patton, T.C.(Eds), Pigment Handbook, 3 vols. John wiely, Chichester, 1988.
5. Mclaren, K., The colour science of dyes and pigments, 2nd edn. Adam Hilger: Bristol, 1983.
6. Hamburg, H.R. and Morgans, W.M. (Eds), Hess's paint film Defects, 3rd edn. Chapman & Hall, 1979.

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	To get an knowledge of synthesis of coloured pigments-I	15
CO-2	To know the synthesis of coloured pigment-II	15
CO-3	To be able to utilize the knowledge and skills for processing of specialty pigments	20
CO-4	To illustrate the manufacturing of functional pigments	20
CO-5	To describe the methods for manufacturing of Anticorrosive pigments.	20
CO-6	To build a bridge between theoretical and practical concept used in pigment industry	10

List of Experiments:

1. To determine the Tinting Strength of given pigment.
2. To determine the Reducing Strength of given pigment.
3. Preparation of Lead chrome Pigment.
4. Preparation of silica flake pigment.
5. Preparation of mica pigment.
6. Preparation of Pigment Concentrates.
7. Preparation of anticorrosive paint
8. Preparation of antifouling paint.

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Open Ended Project fields:-
Students are free to select any area of science and technology based on chemical technology applications to define Projects.

Some suggested projects are listed below:

1. Literature survey on Anticorrosive Pigment.
2. Carry out synthesis of Anticorrosive Pigment.
3. Report preparation on Anticorrosive Pigment.
4. PPT on Anticorrosive Pigment.

List of Open Source Software/learning website:

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