

GUJARAT TECHNOLOGICAL UNIVERSITY
CHEMICAL TECHNOLOGY (36)
SUBJECT NAME: SPECIALTY PIGMENTS & RECENT DEVELOPMENT IN
PIGMENT TECHNOLOGY (DE-VII)
SUBJECT CODE: 2173613
B.E. VII SEMESTER

Type of Course: Chemical Technology

Pre requisite: Basic Knowledge of Speciality Pigments & recent pigment technology.

Rationale: The main objective of this subject is to study the basic applications applied in of various types of Speciality Pigments in chemical industries. This subject provides fundamental knowledge of various types of Speciality Pigments & recent pigment technology 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)		PA(V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	3	7	70	20	10	20	10	20	150

L-Lectures; T-Tutorial/TeacherGuidedStudentActivity;P-Practical;C-Credit;ESE-EndSemesterExamination; PA-Progressive Assessment, ALA- Active Learning Assignment, OEP- Open Ended project

Content:

Sr. No.	Topic	Total Hrs	Module Weightage (%)
1	Specialty Pigments: Introduction, Metallic, Interference and Cholesteric Pigments Aluminium, copper. Nacreous, luminescent (fluorescent/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.	16	32
2	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	20
3	Nano Pigments: Manufacture and properties of nanopigments: alumina, silica, titanium dioxide, iron oxides, zinc oxides, silver, CaCO ₃ , etc. on Nano scale; Bimodally porous nanoparticles (e.g. titanium tetraisopropoxide), variables affecting particle size aggregation and crystal structure. Their use as spacing extenders / functional pigments in paints, reinforcing agent	08	16

	in polymers, heat & wear resistant materials, etc		
4	Anticorrosive pigments: Red lead, basic lead silicochromate, zinc and strontium chromates, white molybdate, calcium plumbate, etc. Passivation mechanism of corrosion resistance.	08	16
5	Recent development in Pigment Technology: Thinning, tinting, straining & filling of finished products, design & operation of tinting machines in pigment dispersion. Ultrasound dispersion, Cavitation mechanism.	08	16

Suggested Specification table with Marks (Theory):

Unit No	Unit Title	Distribution of Theory Marks					
		R Level	U Level	A Level	N Level	E Level	Total
1	Specialty Pigments	19.2	5.4	5.4	1	1	32
2	Functional pigments	12	2	4	1	1	20
3	Nano Pigments	9.6	1.6	1.6	1.6	1.6	16
4	Anticorrosive pigments	9.6	1.6	1.6	1.6	1.6	16
5	Recent development in Pigment Technology	9.6	1.6	1.6	1.6	1.6	16

Legends: R: Remembrance; U: Understanding; A: Application and above Levels (Revised Bloom's Taxonomy References: Text/ Ref. Books), N: Numerical, E: Evaluation

References: Text/ Ref. 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 Wiley, 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 Outcomes:

1. To get an introductory knowledge of Specialty Pigments & Recent development in Pigment Technology.
2. To know the various types of speciality, functional, nano pigments & recent developments.
3. To be able to apply this knowledge in pigments & paints industries
4. To build a bridge between theoretical and practical concept used in industry

List of Experiments:

1.	To determine the Tinting Strength of given pigment.
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2.	To determine the Reducing Strength of given pigment.
3	Preparation of TiO ₂ -Nano Pigment.
4.	Preparation of Iron Oxide -Nano Pigment.
5.	Preparation of Lead chrome Pigment.
6.	Preparation of silica flake pigment.
7.	Preparation of mica pigment.
8.	Preparation of Pigment Concentrates.
9.	To Study the Ultrasonication Technology.
10.	To Study the Dispermat.

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

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.