GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)

ENGINEERING OF PIGMENTED DISPERSION.
SUBJECT CODE: 2183613
B.E. VIIIth SEMESTER

Type of Course: Chemical Technology

Prerequisite: Studied the subjects of previous semesters. Basic Knowledge of Pigment dispersion is required.

Rationale: The main objective of this subject is to study the basic Knowledge of Pigment dispersion.

This is applied in of various types of paints in chemical industries. This subject provides fundamental knowledge of various types of Pigments and Applicability of this pigment dispersion process in chemical industries.

Teaching Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	0	4	70	20	10	0	0	0	100

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1	**Stages of Pigment Dispersion:** Immersion & wetting of pigments, penetration and separation of agglomerates, statistical considerations of mechanical deagglomeration, Stabilisation of colloidal pigment dispersion- entropic & charged double layer mechanism of stabilization, variables affecting stabilization, adhesion & cohesion phenomenon associated with dispersion; initial dispersion, mill base & letdown compositions; flow point curves, instrumental analysis of fineness of dispersion.	12	24
2	**High speed mixers:** underlying fluid mechanics, mill base rheology, tank & impeller dimensions, different impeller geometries & orientations, power input, Heavy duty & miscellaneous mills: sigma kneaders, pug mixers, planetary mixers.	8	16
3	**Ball mills:** Cascading principle, size, speed & design of ball mill; size, shape & composition of balls; mill base composition, power consumption, batch & continuous operation.	12	24

	Roll mills: single, Double, Triple roll mills, flow of mill base through rolls, material balance, mill base composition, roll design & power inputs.		
4	**Attritor:** mechanism of attrition, batch & & continuous operation, design aspects, comparison with ball mill **Micro bead mill:** vertical open, vertical closed & horizontal mills, mechanism of bead milling; effect of retention time/ flow rate, grinding media size, shape & composition, pigment size and size distribution, nature of premix processing, mill base composition on fineness and stability of micro bead dispersion,	10	20
5	**Fire, explosion & health hazards:** General industrial hazards, prime causes of fire & explosion, safety considerations in arrangement of underground and above ground primary & secondary solvent storage tanks, design of piping, pumps & vessels from safety point of view, cleaning & disposal considerations, safety norms & regulations	8	16

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**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. 'Organic coatings : Science and Technology'**,** Edited by Zeno W. Wicks, Jr., Frank N. Jones, S. Peter Pappas; Douglas A. Wicks,Third Edition, John Wiley & Sons, Inc., Hoboken, New Jersey. 2007.
2. Morgans, W.M., 'Outline of Paint Technology', 3rd Edition, CBS Publishers and Distributors, New Delhi, 1996
3. "Surface Coatings" Volume 1 "Raw material and their usages" Oil and Colour Chemists' Association, TAFE Educational Books, NSW, Australia,1987.
4. Paul Swaraj, "Surface Coatings –Science and Technology", Wiley Interscience Publishers, John Wiley and Sons, Inc.1986.
5. 'Paints, Coatings and Solvents', Dieter Stoye; Werner Freitag (ed.), 2nd. Edition,Wiley-VCH. Weinheim ; (1998).

Course Outcomes:

1. To get an introductory knowledge of technology of stages of pigment dispersion & machineries.
2. To know the various stages of dispersion & dispersion machineries.

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 Open Source Software/learning website:

1. Literature available on internet
2. Dyes 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.