

GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)

TECHNOLOGY OF PIGMENTS

SUBJECT CODE: 2163604

B.E. 6th SEMESTER

Type of course: Chemical Technology

Prerequisite: Studied subject DP-05 (**Technology of Pigments**).Basic Knowledge of Dyeing Technology.

Rationale: The main objective of this subject is to study the basic Technology applied in of various types of pigments in chemical industries. This subject provides fundamental knowledge of various types of pigments and how to carry out manufacturing & applications of these pigments in chemical industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			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.	Content	Total Hrs.	% Weightage
1	Pigments: Definitions of pigment, extenders, dyes, pigment dyestuffs, toner and lakes; Classification of inorganic and organic pigments with examples, additive and subtractive colour mixing.	10	17
2	General methods of processing and synthesis of inorganic pigments: Crushing and grinding, vaporization, co precipitation, filtration, drying, flushing, calcinations/roasting, vapour phase oxidation etc. Raw materials for organic pigments: A brief study of coal tar distillation and the role of distillation products in the manufacture of synthetic dyes: bases and precipitants used in the colour striking, toners and lake formation.	14	23
3	Extenders or filler pigments: Sources, manufacture, properties and uses of carbonates, sulphates and other extender pigments like Calcium carbonate, hydrated aluminium oxide, aluminum silicates/ china clays, Magnesium silicate/ talc.	12	20
4	White prime pigments: Methods of manufacturing, comparison of properties and composition of TiO ₂ , ZnO, Zinc sulphide and lithopone, Surface treatment of TiO ₂ , crystal structure and hiding power of TiO ₂ . Manufacture, properties and applications of Black Pigments: Channel blacks, Furnace blacks, Lampblacks,	14	23

	Acetylene black, Graphite, black iron oxide, Jetness of black		
5	Blue and Green Pigments: Properties, composition and manufacturing of following; Chrome green, pigment green B, Ultramarine blue, Prussian blue, Phthalocyanines: Copper phthalocyanines, phthalocyanine green.	10	17

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
60	25	5	5	5	00

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

Reference Books:

1. G. Buxbaum (Ed.), Industrial Inorganic Pigments, Second, Completely Revised Edition, 1998 ,ISBN 3-527-28878-3
2. Braun, J. H., White Pigments, Federation of Societies for Coatings Technology, Blue Bell, PA, 1995.
3. Challener, C., Update on Inorganic Pigments, JCT Coat. Tech, 2005, 2(18), 44.
4. Herbst, W.; Hunger, K., Industrial Organic Pigments, 3rd ed., Wiley-Interscience, New York, 2004.
5. Lewis, P. A., Ed., Pigment Handbook, 2nd ed., Vol. I, Wiley-Interscience, New York, 1988.
6. Herbst, W.; Hunger, K., Industrial Organic Pigments, VCH, New York, 1997.
7. Vanderhoff, J. W.; et al., Polym. Mater. Sci. Eng., 1991, 64, 345.
8. Lewis, P. A., Organic Pigments, Federation of Societies for Coatings Technology, Blue Bell, PA, 1995.

Course Outcome:

1. To get an introductory knowledge of Pigments Technology.
2. To know the classification, types & manufacturing of pigments.
3. To be able to apply this knowledge in Pigments industries
4. To build a bridge between theoretical and practical concept used in industry

List of Experiments:

1. Identification of Pigment- Spot Test.
2. To determine the Oil Absorption value of given pigment.
3. To determine the Bulk Density of given pigment
4. To determine the Bleeding Tendency of given pigment.
5. To determine the % Moisture content of given pigment
6. To Determine the Acidity & Alkalinity of given pigment
7. Preparation of Zinc Oxide Pigment
8. Preparation of Phalocyanine Blue Pigment
9. Preparation of Azo Pigment- Para Red.

10. Preparation of Barium Sulphate Pigment

11. Preparation of Lead Chrome Pigment

Design based Problems (DP)/Open Ended Problem:

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 synthesis of Nano Pigment.
2. Carry out synthesis of Nano Pigment.
3. Carry out synthesis of Nano Pigment. Product profile and its manufacturing process of Nano Pigment etc
4. PPT on Nano 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 industry.
5. Dyes & Pigments, Pigment & 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. The best three works should submit to GTU.