GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163615

Synthetic Pigments

Semester-VI

Type of course: Chemical Technology

Prerequisite: Basic knowledge of inorganic pigments

Rationale: The main objective of this subject is to study 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	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.	% Weightage
1	Introduction to pigment, Classification, Economic Aspects and Uses, New Developments, General Chemical and Physical Properties, Chemical Composition, Analysis, Methods of Determination, Color Properties.	08	15
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.	08	15
3	**Extenders or filler pigments:** Sources, Methods of manufacturing, properties and uses of carbonates, sulphates and other extender pigments like Calcium carbonate, hydrated aluminium oxide, aluminum silicates/ china clays, Magnesium silicate/ talc.	10	20
4	**White pigments:** Introduction, properties, Methods of manufacturing, properties and composition, quality, after treatment, uses, economic aspects of TiO_2, ZnO, Zinc sulphide and lithopone. **Black pigments:** Introduction, properties , Methods of manufacturing processes like Channel blacks, Furnace blacks, Gas black, Lamp blacks, Thermal back, Acetylene black, after treatment, testing & analysis	14	23

5	**Colored Pigments:** Introduction, properties, Methods of manufacturing, properties and composition, quality, after treatment, uses, economic aspects of iron oxide, chromium oxide, mixed metal oxide, cadmium, bismuth, chromate, molybdate and molybdate orange, chrome green, ultramarine blue, prussian blue, phthalocyanine	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:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	To get an introductory knowledge of inorganic pigments	30
CO-2	To be able to utilize the knowledge and skills for general methods of processing and synthesis of inorganic pigments	28
CO-3	To illustrate the manufacturing of extenders.	27
CO-4	To explain the manufacturing processes of white pigments.	5
CO-5	To describe the methods for manufacturing of black pigments.	5
CO-6	To express technical knowledge of coloured pigments.	5

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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 Extender
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