GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)

SUBJECT NAME: NEW FUNCTIONAL DYES & RECENT TRENDS IN DYES TECHNOLOGY (DE-VIII)

SUBJECT CODE: 2173615

B.E. VIIth SEMESTER

Type of Course: Chemical Technology

Prerequisite: Studied subjects of previous semesters. Basic Knowledge of Recent Trends in Dyes & Pigments Technology.

Rationale: The main objective of this subject is to study the New Functional dyes & Recent Trends in Dyes Technology in chemical industries. This subject provides fundamental knowledge of new functional Dyes which is applicable in chemical industries.

Teaching and Examination Scheme:

Teaching			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	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	Teaching Hours	Module Weightage %
1	**New functional dyes:** Introduction, Interactions of Functional Dyes. **Metal-Complex Dyes:** Introduction, Chemical Constitution and Properties. **Solvent Dyes:** Introduction, Chemical Constitution and application properties. **Fat and Oil Soluble Dyes:** Dyes Soluble in Polymers; Solvent Dyes for Other.	16	30
2	**Applications of Functional Dyes:** Functional Dyes by Application: Laser Printing and Photocopying; Thermal Printing; Ink-Jet Printing, **Other Technologies:** Dyes in Solar cells, Dyes in Fluorescent Sensors and Probes, Dyes in electro photography.	10	20

3	**Hair Dyes:** Bleaching, Dyeing with Oxidation Dyes, Dye Classes, Product Forms, Dye-Removal Preparations, Testing of Hair Dyes. **Food Dyes:** Introduction**,** Uses and Individual Substances, Examples of Chemical Structures, Purity Requirements.	10	20
4	**Recent development in dyeing Technology:** Technology involved is based on solvents used in typical dyes synthesis reactions with emphasis on selection criteria. Ionic liquids as solvents. Solid-solid reaction. Statistical quality control techniques. Specifications of raw materials, process parameters, other quality parameters & their statistical treatment. Methods of dyeing.	08	16
5	**Recent Applications of dyeing Technology**: Dye-sensitised solar cell (DSSC) Technology, Electrochemical dyeing, Plasma technology, Supercritical Dye system.	06	12

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	New functional dyes	10	8	4	4	4	30
2	Applications of Functional Dyes	6	5	5	2	2	20
3	Hair Dyes	6	5	5	2	2	20
4	Recent development in dyeing Technology	6	3	3	2	2	16
5	Recent Applications of dyeing Technology	6	2	2	2	2	14

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

References:

1. G. Buxbaum (Ed.) Industrial Inorganic Pigments, Second, Completely Revised Edition, 1998 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
2. H. M. Smith (Ed.) High Performance Pigments 2002 WILEY-VCH Verlag GmbH & Co.
   KGaA, Weinheim.
3. Willy Herbst, Klaus Hunger, Industrial Organic Pigments- Production, Properties,Applications Third, Completely Revised Edition (With Contributions byGerhard Wilker, Heinfred Ohleier and Rainer Winter) 2004 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

Course Outcomes:

1. To get an introductory knowledge of New Functional dyes & Recent Trends in Dyes Technology.
2. To know the New Functional dyes, metal complex dyes, hair & food dyes & Recent Trends in Dyes Technology
3. To be able to apply this knowledge in Dyes industries
4. To build a bridge between theoretical and practical concept used in industry.

List of Experiments:

1.	Identification of functional dyes.
2.	Synthesis of some coumarin functional dyes.
3	Synthesis of Acid Dye Metal Complexes
4.	Synthesis of Solvent Dyes Based on 2-Hydroxy-4-n-octyloxybenzophenone.
5.	Synthesis of Hair dyes.
6.	Synthesis of Food dyes.
7.	To study the Methods of dyeing.
8.	To study Dye-sensitised solar cell (DSSC) Technology.
9.	To study Electrochemical dyeing.
10.	To study Plasma technology.
11	To study Supercritical Dye system.

Open Ended Project fields:-

Students are free to select any area of Engineering &Technology based on chemical technology applications to define Projects.

Some suggested projects are listed below:

1. Literature survey on New functional dyes.
2. Carry out synthesis of New functional dyes.
3. Carry out synthesis of New functional dyes. Product profile and its manufacturing process of New functional dyes.
4. PPT on New functional dyes.

List of Open Source Software/learning website:

1. Literature available on internet
2. Dyes & Pigments dictionaries
3. Delnet
4. Literature available under R&D in dyes industries

5. Dyes 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.