GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)
TECHNOLOGY OF INTERMEDIATE & COLORANTS
SUBJECT CODE: 2153604
B.E. 5thSEMESTER

Type of Course: Chemical Technology

Prerequisite: Studied subject DP-03 (Technology of Intermediates & Colorants) Basic knowledge of Technology.

Rationale: The main objective of this subject is to study the basic Technology applied in synthesis & unit operations of various types of dyes in chemical industries. This subject provides fundamental knowledge of various types of dyes and how to carry out synthesis & unit operations of these dyes 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)	
					PA	ALA	ESE	OEP		
3	0	3	6	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
01.	Unit operations in dyestuff industry: Heating & cooling media, Materials of construction, pressure reactors. Pressure reactions – Engineering Aspects. Pressure vessels, their Design & Material of Construction.	08	16
02	Technology Involving Unit Processes: Nitration, sulphonation, reduction, halogenations. Hydrogenation reaction, ammonolysis, aminolysis, hydroxylation, Friedel Craft's reactions & other commonly used processes..	08	16
03	Aspects of Unit Operations: Acidity functions. Safer methods of nitration's, sulphonation, chlorosulphonations, Friedel Craft's reactions. Some aspects of unit operations like evaporation, distillation, filtration, drying & transportation of materials in dyestuff industry,agitation systems & particle size reduction.	12	24
04	Manufacturing of raw materials: such as phenol, aniline, 2-naphthol, anthraquinone & its derivative, BON acid, phthalic anhydride, naphthol sulphonic acids, naphtylamine sulphonic acids, aminonaphthol sulphonic acids. Manufacturing of some important solvents used in dyestuffs & pigments industry.	12	24
5	Technology involved in the production of dyes: Azo, acid, direct, reactive, mental – complex dyes, azoic components, basic dyes, typical fluorescent whiteners. Principles in isomer separations. Continuous versus batch &	10	20

	semi-batch operations with examples.		

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
60%	**12.2%**	**12.6%**	**7.6%**	**7.6%**	**-**

Reference Books:

1) Unit Processes in Organic Synthesis by Groggins P.H - Mc Graw Hill, 2001
2) Chemical Process Industry by Joseph A Brink & R N Shrieves - Mc Graw Hill, 1984
3) Fundamental Processes of Dye Chemistry by Fierz, David - Blangey, Interscience Publishers, 1955.
4) Industrial Organic Chemistry by Weissermal K, and Arpe H.J. - John Wiley, 1997.
5) Organic Synthesis by Smith M.B - Tata McGraw Hill, New York - 2nd Ed., 2004.
6) Chemistry of Synthetic Dyes by Lubs H.A.,Robert E Krieger - Company New York, 1995.
7) Organic Chemistry by Clayden, Greeves, Warren - Oxford Univ. Press, 2001.
8) Chemistry of Synthetic Dyes by Lubs H.A., - Robert E Krieger Publishing Company New York - 1st Ed.1995
9) Color Chemistry: Syntheses, Properties and Applications of Organic Dyes and Pigments by Heinrich Zollinger - Wiley-VCH - 2nd Ed, 1991.

Course Outcome: After learning this course the students can:

1. To get an introductory knowledge of unit operations in dyes.
2. To know the unit operations, unit processes, production technology.
3. To be able to apply this knowledge in dyes & pigments industries.
4. To build a bridge between theoretical and practical concept used in industry

List of Experiments:

1. Synthesis of Schiff's Base from aniline.
2. Synthesis of Schiff's Base from para-chloroaniline.
3. To estimate the amount of para-chloroaniline in the given solution.
4. To estimate the amount of sulfanilic acid in the given solution.
5. To estimate the amount ortho-nitro aniline in the given solution.
6. To estimate the amount of meta-nitro aniline in the given solution.
7. To estimate the amount of para-nitro aniline in the given solution.
8. Synthesis of Magneson-I.
9. Synthesis of m-dinitrobenzene from nitrobenzene.
10. Synthesis of p-aminobenzene from nitrobenzene.

Design based Problems (DP)/Open Ended Problem:

Application and utility of NITRATION as unit process in Chemical Technology.

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 & Pigment industry.
5) Dyes & Pigments Tech. 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.