

GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36) CHEMISTRY OF INTERMEDIATES & COLORANTS-I SUBJECT CODE: 2133604 B.E. 3RD SEMESTER

Type of Course: Chemical Technology

Prerequisite: Basic knowledge of organic chemistry

Rationale: The main objective of this subject is to study chemistry of benzenoid and naphthalene aromatics. This subject provides fundamental knowledge of benzenoid and naphthalene based dyes intermediates and their orientation.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
			PA	ALA	ESE	OEP				
4	0	0	4	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction: Definition, classification & importance of dyes, Chemical Feedstock for dyestuff industry-fossil feedstock – coal, petroleum-coal-tar primaries: renewable raw materials.	6	15
2.	Chemistry of benzenoid aromatics: Electrophilic aromatic substitution reactions with their mechanisms, one carbon electrophiles & their utility. Nucleophilic aromatic substitution reaction Orientations in aromatic substitution reaction. Hammett substitution constants. Introduction of various functional groups into benzenoid aromatics, functional group interconversions. Synthesis of typical dyestuff intermediates based on benzene, xylene, toluene.	12	30
3	Chemistry of naphthalene-Electrophilic aromatic substitution reactions: Bucherer reaction, Reverse Bucherer reaction. Synthesis of naphthols, naphthylamines, naphtholsulphonic acid, naphthylaminesulphonic acids, aminonaphtholsulphonic acids. Bond acid arylides as Azocoupling components. Anthracene & condensed aromatics. Anthraquinone & benzanthrone. Reactions of anthraquinone, benzanthrone & synthesis of dyestuff intermediates based on anthraquinone & benzanthrone.	14	35
4.	Active methylene compounds: Acetoacetic ester, malonic ester, malononitrile & their use in synthesis of dyestuff intermediates, diketene, acetoacetalides.	12	20

	Simple heterocyclic compounds like pyrazolones, aminopyrazoles, pyrimidines, pyridines. Evolution of dyestuff chemistry.		
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Reference Books:

1. Industrial Organic Chemistry, Arpe H.J.VCH, Weinheim, Weissermal K.1993
2. Organic Synthesis, Smith M.B., Tata McGraw Hill, New York, 2nd Ed., 2004
3. Chemistry of Synthetic Dyes, LubsH.A., Robert E Krieger Publishing Company New York, 1995
4. Organic Chemistry, Clayden, Greeves, Warren, Oxford Univ. Press, 2001
5. Chemistry of Synthetic Dyes, Lubs H.A., Robert E Krieger Publishing Company New York, 1st Ed.,1995
6. Chemistry of Synthetic Dyes – Vol I, Venkatraman K., Academic Press, New York, 2009
7. Chemistry of Synthetic Dyes – Vol II, Venkatraman K., Academic Press, New York, 2009
8. Chemistry of Synthetic Dyes – Vol III, Venkatraman K., Academic Press, New York, 2009
9. Chemistry of Synthetic Dyes – Vol IV, Venkatraman K., Academic Press, New York, 2009
10. Chemistry of Synthetic Dyes – Vol V, Venkatraman K., Academic Press, New York, 2009
11. Chemistry of Synthetic Dyes – Vol VI, Venkatraman K., Academic Press, New York, 2009
12. Color Chemistry: Syntheses, Properties and Applications of Organic Dyes and Pigments, Heinrich Zollinger, Wiley-VCH, 2nd Ed, 1991

Course Outcomes:

At the end of this course students will be able to:

1. To express basic chemistry of dyes intermediates
2. To carry out synthesis of intermediates
3. To be able to utilize this knowledge in industries
4. To build a bridge between theoretical and practical concept used in industry.

List of Open Source Software/learning website:

1. Chemical weekly
2. Dyes and pigment journal
3. Scifinder online
4. Sciencedirect
5. espacenet
6. Delnet

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.