



**Gyanmanjari**  
Innovative University

Syllabus  
Gyanmanjari Science College  
Semester-2 (M.Sc.IC)

**Subject:** Natural and Synthetic Dyes-MSICIN12508

**Type of course:** Major

**Prerequisite:** To teach students about how dyes are used to color textiles, plastics, paper and other materials. Intermediates are chemical building block that is used to make dyes.

**Rationale:** This will provide the students with the foundation they need to understand the principle of dye and intermediate productions.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

**Course Content:**

Unit No	Course content	Hrs	% Weightage
1	<b>Chapter-1 General Introduction</b> Diazotization, mechanism and different methods of diazotization and laws of coupling. General introduction, classification and synthesis of monoazo dyes, bisazo dyes and azoic dyes. Evaluation of dyes. <b>Chapter-2 Heterocyclic Dyes</b> Phthalocyanine dyes, Azoic dyes (Para red), Sulfur containing dyes, Reactive dyes, Disperse dyes, Brightening agents (Optical bleaches). Uses of dyes.	15	25



2	<b>Chapter-3 Reaction Intermediates</b> Carbocations: Stability of carbocations, Generation of Carbocations, Reactions of Carbocations, Applications. Carbanions: Stability of carbanions, Generation of Carbanions, Reactions of Carbanions. Free radicals: Stability of free radicals, Generation of Free radicals, Reactions of free radicals, Mechanism of free radicals, Applications of free radicals. Carbenes. Nitrenes.	15	25
3	<b>Chapter-4 Synthesis of some industrially important food colors and dyes:</b> Dyes: Synthesis and application of industrially important dyes. Non-textile applications of dyes, Auramine O & G, Methylene Blue, Mercurochrome, Phenolphthalein. Methyl orange, Fast sulphone black, Benzidine yellow, Benzidine orange. Indigo solution blue, Brown-RRD, Alizarin, Benzanthone, Dibenzanthone, Caledon-Z Green.	15	25
4	<b>Chapter-5 Synthesis of the following dyes:</b> Rosaniline (Magenta), Crystal violet, Pyronine G, Fluorescein, Eosin (mercurochrome), Deep red, Indigo, Procion blue HB. Procion red, Congo red, Direct black -E, Direct green, Tetrazine.	15	25

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Prepare Poster</b> Faculty will provide topics for the poster and students will prepare and upload them on the GMIU web portal.	10
2	<b>Quiz</b> Faculty will assign 10 MCQs per unit. Students will answer and upload an answer sheet on the GMIU web portal.	10
3	<b>Structure Identification</b> Faculty will assign unknown compounds data. Students identify the given structure and give a name and a brief introduction of it (In 100 words) and upload on the GMIU web portal.	10
4	<b>Pro-Con Grid</b> Faculty will assign a topic that lends itself to the idea of making lists of pros and Cons (software) advantages and disadvantages for some issue (see pointers for suggestions). Students will make a post for the same, and it will be uploaded to the GMIU web portal.	10
5	<b>Post It Parade</b> Faculty will assign questions students are prompt for which they need to generate ideas, solutions, etc. (through software). Students will make a post for the same, and it will be uploaded to the GMIU web portal.	10
<b>Total</b>		<b>50</b>



**Suggested Specification table with Marks (Theory):60**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	40%	00	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course the students should be able to:	
CO1	Recall basic understanding of dyes and dyes design.
CO2	Summarize the general idea for the structure, synthesis and biological importance of dyes.
CO3	Construct the chemistry of various dyes and food colors.
CO4	Familiarize the students with the various industrial processes.
CO5	Differentiate between dyes and pigments and understand their respective uses.

**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.



**Reference Books:**

- [1] The Chemistry of Synthetic dyes, Vol. I to VII by Venkataraman, Academic Press, New York
- [2] Technology of Textile Processing by V. A. Shehnai, Sevak Publications, Bombay.
- [3] Introduction to industrial Chemistry, Howard L. Whate, Wiley-Interscience.
- [4] Organic Reactions and Mechanism by V.K. Ahluwalia, Narosa Publishing House.

