

Aim

To give the students a thorough knowledge about the synthesis, mechanism, photophysical properties and applications of various dyes and pigments

Course outcome statement

Module No	Outcome Statement
1	Student will have a basic understanding about colour and chemical constitution
2	Students will be capable of understanding study about chemical structure and quantitative evaluation of properties of dyes.
3	Students will have in-depth knowledge about nomenclature and synthetic mechanism of dyes in detail.
4	Students will be able to identify the different applications of dyes for the welfare of human beings and new research trends in dye chemistry.
5	Students will be able to establish the basic understanding and applications of both organic and inorganic based pigments in daily life

Module 1 : Colour Chemistry

Colour, colour wheel, complementary colour, Theories of colour and chemical Constitution: Witt's chromophore – auxochrome theory, Resonance theory, Modern theories of colour: Valence bond theory, Molecular Orbital theory.

Module 2: Chemistry of Dyes

Requirement of dyes, Chemical nature, Classification: Natural and synthetic, Based on structure: (a) Triphenyl methane, (b) Azo dyes (c) Anthraquinone dyes (d) Indigoid dyes (e) Xanthene dyes (f) Cyanine dyes (g) Squaraine dyes (h) Croconine dyes, Classification based on application. Quantitative Evaluation of Dyes: Pariser-Parr-Pople molecular orbital method (PPP MO), Huckel molecular orbital (HMO).

Module 3. Nomenclature and synthesis of representative dyes

Based on Colour Index alphabets : B, C, G, 2G, 3G, H, HE, L, ME, R. General methods of Synthesis of dyes: (a) Cyanines, (b) Hemicyanines, (c) Squaraines (d) Azo dyes, (e) croconaines. Synthesis of individual dyes such as Aminosquaraines, Alizarin, Mercurochrome-Red, Congo-Red, Amido Black 10B, Procion Red, Fuchsine.

Module 4 : **Applications of Dyes**

Application in PDT, Sensing, Bioimaging, Photovoltaic devices, paint industry, Non-linear optical applications of Dyes, Applications of encapsulated Squaraine dyes, Bioconjugated Squaraine dyes, Aggregation properties and applications of cyanine dyes, Solar cell applications, Miscellaneous applications.

Module 5 : **Chemistry of Pigments**

The flower pigments: Anthocyanins, Flavones, structure of Delphinidin Chloride, Pelargonidine Chloride, Quercetin. Phthalocyanine : Copper Phthalocyanine, applications. Carotenoids: structure of β - carotene, lycopene, application in food industry. Fluorescent brightening agents: synthesis and applications of Blankophor – R, Blankophor –WT. Inorganic Pigments.

Text books /References

- [1] **Dyes and Pigments: New Research: Arnold R. Lang, Nova Science Publishers, Inc.2008.**
- [2] **Modern Organic Chemistry, Jain, M.K. & Sharma, S.C. Vishal Publishing Co. 2010.**
- [3] **Handbook of natural dyes and pigments: Har Bhajan Singh, Kumar, Avinash Bharati, Woodhead Publishing India Pvt Ltd, 2014.**
- [4] **Handbook of Fluorescent Dyes and Probes: R. W. Sabnis, Wiley, 2015.**

SCHEME OF EVALUATION

Sl No.	In- semester assessment		End – semester assessment	
1	Periodical test	30 marks	End Semester Examination	50 mark
2	Assignment	10 marks		
3	Seminar	10 marks		
4	Sub total	50	50	
	Grand total		100	

ACTIVITIES/ CONTENT WITH DIRECT BEARING ON EMPLOYABILITY/ ENTREPRENEURSHIP/ SKILL DEVELOPMENT (based on NAAC Criteria):

The learner will get a clear understanding of the concepts and ideas regarding the technical and theoretically relevant area which is explored in the course. This course will equip the learner to build a career as a Faculty in Chemistry, Research Scientist in academia as well as Industry which works with dyes and pigments