

Course Code	Course Name	Credits
26CH501	CONCEPTS OF ORGANIC CHEMISTRY	04

Course Objectives

- To understand the principles of stereochemistry, including chirality, symmetry, and different molecular representations.
- To analyze stereochemical behavior and reactivity, including conformations, stereoselective reactions, and asymmetric synthesis.
- To explain reaction mechanisms using physical organic chemistry concepts, such as thermodynamics, kinetics, and substituent effects.
- To develop knowledge of aromaticity and heterocyclic compounds, including their structure, properties, and reactions.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand stereochemical concepts including chirality, symmetry, conformations, and optical activity.
- Apply advanced stereochemistry concepts such as stereoselectivity, asymmetric synthesis, and chiral reagents.
- Analyze reaction mechanisms using physical organic chemistry concepts like substituent and solvent effects.
- Explain aromaticity, heterocyclic compounds, and their reactions and applications.

Unit 1 - Stereochemistry (12 Hrs.)

Elements of symmetry and chirality; optical activity in the absence of chiral carbon; molecules with more than one chiral centre; projection formulae—Fischer, Newman, Sawhorse, and flying wedge representations; conformational analysis of acyclic and cyclic systems; effect of conformation on reactivity; threo and erythro isomers; enantiotopic and diastereotopic atoms, groups, and faces; racemic modification and methods of resolution; specific rotation, optical purity, and enantiomeric excess.

Unit 2 – Advanced Stereochemistry (14 Hrs.)

Configuration and conformations of cycloalkanes; conformation and its effect on reactivity; stereochemistry of allenes, spiranes, and biphenyls; molecules with chiral planes; topicity—enantiotopic and diastereotopic relationships; stereoselective and stereospecific reactions; enantioselective reactions; asymmetric synthesis using chiral auxiliaries, chiral catalysts, and chiral reagents.

Unit 3 - Introductory physical organic chemistry (12 Hrs.)

Thermodynamic stability; relationship between thermodynamic stability and reaction rates; electronic substituent effects on reaction intermediates; kinetic isotope effects; linear free energy relationships; principle of microscopic reversibility; substituent effects; solvent and solvent effects; methods for determination of reaction mechanisms.

Unit 4 – Aromaticity (12 Hrs.)

Criteria of aromaticity; Craig's rule; non-benzenoid aromatic compounds; antiaromaticity and homoaromaticity; fused-ring systems; heteroaromatic systems; nucleophilic aromatic substitution reactions (including VNS); transition metal-catalyzed aromatic substitution reactions; aromatic substitution reactions involving radical intermediates.

Unit 5 - Advanced Heterocycles (10 Hrs.)

Nomenclature of heterocyclic compounds; heterocycles containing two heteroatoms; fused five- and six-membered heterocyclic systems; preparation and reactions of indole, quinoline, isoquinoline, and carbazole.

Reference Books:

- R. T. Morrison, R. N. Boyd, and S. K. Bhattacharjee, Organic Chemistry, 7th Edn., 2011, Pearson Prentice Hall.
- S. H. Pine, Organic Chemistry, 2008, Tata McGraw Hill, 5th Edn.
- W. Carruthers, and I. Coldham, Modern methods of Organic Synthesis, 2005, Cambridge University Press, First South Asian edition
- J. March and M. B. Smith, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 6th Edn., 2007, Wiley.

Websites and eLearning Sources:

- <https://www.youtube.com/watch?reload=9&v=yzfcwJ37kI>
- <https://nptel.ac.in/courses/104105086>
- <https://www.youtube.com/watch?v=ab4WFo0Eq-k>

COs and Bloom's Taxonomy Mapping – 26CH501

Course Outcomes	On completing P.G. program the students will be able to	BTL
CO1	Recall facts and explain basic ideas and concepts Stereochemistry, physical organic chemistry, aromaticity and nomenclature of heterocycles.	K1, K2
CO2	Use the information in new situations or solve stereochemistry of molecules, thermodynamic stability.	K3
CO3	Explain the different types of synthesis, physical and chemical properties of oxygen, halogen and nitrogen based organic compounds.	K4
CO4	Justify the stereochemistry and mechanism of different functionalized organic compounds.	K5
CO5	Validate and apply the knowledge of stereochemistry and mechanistic approach for various organic reactions.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26CH501

Course Outcomes	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	1	1	1	3	2	2	1	1	1.58
CO2	2	3	2	1	1	1	2	3	2	2	1	1.83
CO3	2	2	3	2	1	1	2	3	3	2	2	1.92
CO4	2	2	3	2	2	1	2	2	3	3	2	1.83
CO5	2	2	3	2	2	3	2	2	3	3	3	2.17
Total												2

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

