TEACHING PLAN

B.Sc. Physical Sciences

I Semester

COURSE CODE DSC-1: CHEMISTRY- I

COURSE TITLE: BASIC CONCEPTS OF ORGANIC CHEMISTRY

Name of teacher- Dr. SANJAY KUMAR

Mid semester break : October 27, 2024- November 03, 2024

S. No	Date	Sub-topic
1	29.08.2024- 14.09.2024	Types of Electronic displacements: Inductive effect, Resonance effect, Hyperconjugation, Electromeric Effect.
2	16.09.2024– 28.09.2024	Reactive intermediates and their stability: carbocations, free radicals, carbanions, benzyne, carbenes
3	30.09.2024– 12.10.2024	Acidity and basicity in organic compounds (comparison of carboxylic acids, alcohols, phenols, primary, secondary and tertiary aliphatic amines, aniline and its derivatives)
4	14.10.2024– 26.10.2024	Types of projection formulae: Flying Wedge Formula, Newmann, Sawhorse and Fischer representations and their interconversion.
5	04.11.2024– 16.11.2024	Stereoisomerism: Concept of chirality (upto two carbon atoms). Configurational isomerism: geometrical and optical isomerism
6	18.11.2024– 30.11.2024	enantiomerism, diastereomerism and meso compounds). Threo and erythro; D and L; Cis-trans nomenclature
7	02.12.2024– 14.12.2024	CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E/Z nomenclature (for upto two C=C systems).
8	16.12.2024– 25.12.2024	Conformational isomerism with respect to ethane, butane and cyclohexane.

DISCIPLINE SPECIFIC CORE COURSES (DSC)

SEMESTER-I

Course Code DSC-1: CHEMISTRY- I
Course Title: Basic Concepts of Organic Chemistry
Total Credits: 04 (Credits: Theory-02, Practical-02)
Total Lectures: Theory- 30, Practical-60

Objectives: The course is infused with the recapitulation of fundamentals of organic chemistry and the introduction of the concept of visualizing the organic molecules in a three-dimensional space. To establish the applications of these concepts, a study of diverse reactions through mechanisms is included. The constitution of the course strongly aids in the paramount learning of the basic concepts and their applications.

Learning Outcomes:
By the end of the course, the students will be able to:

- Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt.
- Understand the fundamental concepts of stereochemistry.
- Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
- Learn and identify many organic reactions and their mechanisms including electrophilic addition, nucleophilic addition, nucleophilic substitution, electrophilic substitution and rearrangement reactions.

Unit 1: Fundamentals of organic chemistry — Lectures: 05

Types of Electronic displacements: Inductive effect, Resonance effect, Hyperconjugation, Electromeric Effect. Reactive intermediates and their stability: carbocations, free radicals, carbanions, benzyne, carbenes.

Acidity and basicity in organic compounds (comparison of carboxylic acids, alcohols, phenols, primary, secondary and tertiary aliphatic amines, aniline and its derivatives)

UNIT 2: Stereochemistry — Lectures: 07

Types of projection formulae: Flying Wedge Formula, Newmann, Sawhorse and Fischer representations and their interconversion.

Stereoisomerism: Concept of chirality (upto two carbon atoms). Configurational isomerism: geometrical and optical isomerism; enantiomerism, diastereomerism and meso compounds). Threo and erythro; D and L; *Cis-trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and *E/Z* nomenclature (for upto two C=C systems).

Conformational isomerism with respect to ethane, butane and cyclohexane.

UNIT 3: Types of Organic Reactions (Including reactions of alkenes, alkyl and aryl halides, alcohols, aldehydes, ketones) — Lectures: 18

Electrophilic addition reactions

Electrophilic addition reaction (with respect to propene, propyne, 3,3-dimethyl-1-butene): Hydration, Addition of HX in the absence and presence of peroxide, Hydroboration oxidation, Addition of bromine (with stereochemistry).

Nucleophilic addition reactions

Nucleophilic addition reaction of carbonyl compounds: Addition of HCN, ammonia derivatives (Hydroxylamine, Hydrazine, Semicarbazide and 2,4-DNP), the addition of carbanion (Aldol condensation, Claisen Schmidt, Benzoin condensation, Perkin reaction, reactions involving Grignard reagent).

Elimination and Nucleophilic substitution reactions

Nucleophilic substitution reaction (S_N1 and S_N2) in alkyl halides (mechanisms with stereochemical aspect), alcohols (with nucleophiles like ammonia, halides, thiols, ambident nucleophiles (cyanide and nitrite ion)), ethers (Williamson ether synthesis), Elimination reaction (E1 & E2), elimination *vs* substitution (*w.r.t.* potassium t-butoxide and KOH); Nucleophilic aromatic substitution in aryl halides-elimination addition reaction *w.r.t.* chlorobenzene, including the effect of nitro group (on the ring) on the reaction. relative reactivity and strength of C-X bond in alkyl, allyl, benzyl, vinyl and aryl halides towards substitution reactions

Electrophilic substitution reactions

Electrophilic Aromatic substitution with mechanism (benzene)- sulphonation, nitration, halogenation, Friedel craft acylation :*o*-, *m*- and *p*- directive influence giving examples of toluene/nitrobenzene/ phenol/ aniline/ chlorobenzene.

Reactive intermediates and Rearrangement Reactions