CHEMISTRY
(Major)
(2nd Semester)
Course No.:**CHM-DSC-151**
(Organic Chemistry -I)
Introductory Organic Chemistry
Contact Hours: 60; Credits: 03
Full Marks = 100[End Semester Exam (70) Internal Assessment (30)]
Pass Marks = 40 [End Semester Exam (28) Internal Assessment(12)]

UNIT-1: Basics concepts in Organic Chemistry

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties.

Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

UNIT-2: Aliphatic Hydrocarbon

Formation of alkanes, Wurtz Reaction, Corey House synthesis, Free radical substitutions: Halogenation -relative reactivity and selectivity.

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Electrophilic additions their mechanisms (Markownikoff / Anti Markownikoff addition), ozonolysis, reduction (catalytic and chemical). 1, 2-and 1, 4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl Benzene.

Alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-3: Aromatic and Polynuclear hydrocarbon

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/ carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Polynuclear hydrocarbons, Reactions of naphthalene, phenanthrene and anthracene. Preparation, structure elucidation and important derivatives of naphthalene and anthracene; Annulens.

UNIT-4: Stereochemistry and Conformation analysis

Fischer, Newmann and Sawhorse Projection formulae and their inter-conversions;

Geometrical isomerism: *cis–trans* and, *syn-anti* isomerism, E/Z notations with C.I.P rules.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, molecules with two or more chiral-centres, diastereoisomers, meso structures, racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

Conformation analysis of alkanes: Types of cycloalkanes and their relative stability, Baeyer strain theory, Relative stability, Energy diagrams of cyclohexane, monosubstituted, 1,2-, 1,3-, 1,4-disubstituted cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams, Strain-less ring theory.

UNIT-5: Carbohydrates

Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani Fischer synthesis and Ruff and Wohl degradation;

Disaccharides – Structure elucidation of sucrose, lactose

Polysaccharides – Elementary treatment of starch and cellulose.

Reference Books:

- Ghosh, Sachin Kumar; Advanced General Organic Chemistry: A Modern Approach (vol 1 & 2), NCBA
- Jain, M. K., Sharma, S. C.; Modern Organic Chemistry; Vishal Publishing Co.
- Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.
- Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.