**CHEMISTRY-BCHC-51:GROUP –B (theory)**

**ORGANIC CHEMISTRY**

**Organic Spectroscopy: 25 Lectures**

*NMR Spectroscopy:* Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it; Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple compounds.

**Learning Outcome:**

* define and explain the relevant terms and models used in basic NMR theory
* analyze NMR pulse sequences using this basic NMR theory
* execute basic 1-dimentional proton and carbon experiments on a standard NMR spectrometer
* interpret 1-dimentional NMR spectra from simple organic compounds
* How are integration values, spin coupling and coupling constant in H1 NMR useful

**CHEMISTRY-BCHC-42:**

**ORGANIC CHEMISTRY-IV**

**Heterocyclic Compounds: 15 Lectures**

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Pyrimidine, Structure elucidation of indole, Fischer indole synthesis and Madelung synthesis), Structure elucidation of quinoline and isoquinoline, Skraup synthesis, Friedlander’s synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis, Bischler-Napieralski reaction, Pictet-Spengler reaction, Pomeranz-Fritsch Reaction; Derivatives of furan: Furfural and furoic acid.

**Learning Outcome:**

* Heterocyclic compounds are very interesting due to their distinct structure and the availability of this kind of heterocyclic structures in medicinal drugs.
* So the technique of synthesis of heterocyclic compounds is important in the synthesis of different drugs.
* The course aims at giving a fundamental theoretical understanding of heterocyclic chemistry, including alternative general methods for ring synthesis and application of such methods for the preparation of specific groups of heterocyclic systems.
* Moreover, it gives the quantitative ideas about the synthesis, properties and uses of such heterocyclic compounds like pyrole, pyridine qunolene, thiophene, furan etc.
* The student will get familiar with particular properties and reactions for the most important heterocycles as well as different systems of nomenclature.

**Generic Elective Papers (GE) (Minor-Chemistry)**

**GECH-1**

***Section B: Organic Chemistry-1* (30 Periods)**

**Fundamentals of Organic Chemistry: XX Lectures**

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance

and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel’s rule.

Stereochemistry: XX Lectures

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: 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).

* Predict relative energies and locations of frontier molecular orbitals for organic molecules of intermediate complexity using linear combinations of atomic orbitals and hybridized orbital approaches.
* Use reaction kinetics, linear free energy relationships, isotope labeling, stereo-electronic effects and stereochemical outcomes to determine reaction mechanisms.
* Predict reaction mechanisms of major classes of organic reactions, including substitutions, eliminations, additions and radical reactions.
* Recognize the impact of non-covalent interactions in complex systems and reaction mechanisms.
* Calculate optical purity and enantiomeric excess.
* Draw all the stereoisomers of organic compounds, and recognise diastereomers, enantiomers, meso compounds and centres of symmetry.
* Recognise and discuss the stereoisomers of chiral compounds that do not contain a stereogenic carbon centre and assign the configuration of the stereoisomers.
* Explain and predict the stereochemical outcome of organic reactions by considering the reaction mechanism.
* Perform the synthesis, separation and characterisation of organic compounds in the laboratory and report and discuss the results of experiments using the appropriate technical language.