



CHEMISTRY

(Major)

(5th Semester)

Course No.: **CHM-DSC-302**

(Organic Chemistry -III)

Heterocyclic, Biochemistry, Natural products & Photochemistry

Contact Hours: 60; Credits: 04

Full Marks = 100[End Semester Exam (70) Internal Assessment (30)]

Pass Marks = 40 [End Semester Exam (28) Internal Assessment (12)]

UNIT-1: Heterocyclic Compounds

Classification and nomenclature, structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom; Synthesis of Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis). Substitution reactions of Furan, Pyrrole, Thiophene, Pyridine; Derivatives of furan: Furfural and furoic acid.

Pyrimidine: Structure elucidation of indole, quinoline and isoquinoline, Synthesis of Indole (Fischer indole synthesis and Madelung synthesis), Quinoline (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner Miller synthesis), Isoquinoline (Bischler-Napieralski reaction, Pictet-Spengler reaction, Pomeranz-Fritsch reaction).

UNIT-2: Amino acids, peptides and proteins

Amino acids, Peptides and their classification. α -Amino Acids - Synthesis, ionic properties and reactions. Zwitterions, pKa values, isoelectric point and electrophoresis.

Study of peptides: Determination of their primary structures, end group analysis, methods of peptide synthesis.

Proteins: Overview of primary, secondary, tertiary and quaternary structure of proteins. Protein denaturation/ renaturation.

UNIT-3: Enzyme, lipid and nucleic acids

Enzymes: Introduction, classification and characteristics of enzymes. Salient features of active site of enzymes. Mechanism of enzyme action, factors affecting enzyme action, coenzymes and cofactors and their role in biological reactions, specificity of enzyme action (including stereospecificity), enzyme inhibitors and their importance.

Lipids: Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenation of fats and oils, Saponification value, acid value, iodine number.



Nucleic Acids: Components of nucleic acids, Nucleosides and nucleotides; Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine; Structure of polynucleotides.

UNIT-4: Alkaloids and terpenes

Alkaloids: Natural occurrence, General structural features, Isolation and their physiological action. Hoffmann's exhaustive methylation, Emde's modification, Structure elucidation and synthesis of Hygrine and Nicotine. Medicinal importance alkaloids. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine

Terpenes: Occurrence, classification, isoprene rule; Elucidation of structure and synthesis of Citral, Neral and α -terpineol.

UNIT-5: Photochemistry of Organic Compounds

General concepts, Franck- Condon principle; singlet, triplet states; Norrish type I and II processes, Paterno-Buchi reaction, Barton reaction, photo-oxidation and reduction, rearrangements, photo Fries rearrangement, Di - π methane rearrangement, Photochemistry of conjugated dienes.

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).
- Singh J., Singh, J.; Photochemistry and pericyclic reactions; New Age International Publishers