

Course No.	Course Name	L-T-P-Credits
CY 532	Chemistry of Natural Products and Heterocyclic Chemistry	3-0-0: 3
<b>Prerequisite:</b> NIL		
<b>Course Objectives:</b>	<p>The objective of this course is to provide an in-depth understanding of the structure, isolation, chemistry, and biological significance of natural products and heterocyclic compounds. The course explores the chemistry of carbohydrates, alkaloids, terpenoids, and steroids, focusing on their structural features, biosynthetic pathways, and key reactions. Additionally, it covers the nomenclature, synthesis, and reactivity of heterocyclic compounds, including nucleic acids. By integrating the study of structural determination, reaction mechanisms, and synthetic methodologies, this course equips students with the knowledge required for advanced research in organic, pharmaceutical, and biological chemistry.</p>	
<b>Course Outcomes:</b>	<p>After successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the structure, stereochemistry, and reactivity of mono, di-, and polysaccharides, including their conformations and key reactions.</li> <li>2. Describe the extraction methods, structural determination, and chemistry of biologically significant alkaloids.</li> <li>3. Classify terpenoids, elucidate their structures, and understand their synthetic pathways.</li> <li>4. Analyse the basic structure, stereochemistry, and biosynthetic pathways of steroids.</li> <li>5. Apply the principles of nomenclature, synthesis, and reactivity to heterocyclic compounds containing two or three heteroatoms, including aziridines, pyrazoles, and nucleic acids.</li> </ol>	
<b>SYLLABUS</b>		
Module	Contents	Hours
I	<p><b>Carbohydrates</b>  Monosaccharaides, acyclic and ring structure of aldoses and ketoses, anomerization, epimerization and mutarotation, anomeric effect and reactions of carbohydrates, structure, reaction and conformation of disaccharides – sucrose, maltose and lactose. Polysaccharides: Starch and cellulose.</p>	6

II	<b>Alkaloids</b> Extraction, structure determination and chemistry of alkaloids special reference to nicotine, piperine, papaverine, atropine and morphine.	6
III	<b>Terpenoids</b> Classification, isoprene rule, general methods of isolation and structure determination. Biogenetic pathway of mono and sesquiterpenes. Synthesis of $\alpha$ -santonin, abietic acid, gibberellic acid, menthol, caryophyllene and longifolene.	6
IV	<b>Steroid</b> Occurrence, nomenclature, basic skeleton and stereochemistry of steroid. Cholesterol, and its biosynthesis, Sex hormones: Estrogens, androgens and progestin, D-Vitamins and reactions of steroid.	6
V	<b>Heterocyclic Chemistry</b> The nomenclature of heterocyclic compounds containing two and three hetero atoms. Chemistry of heterocycles: Aziridine, oxirane, pyrazoles, imidazoles, oxazoles, pyrimidines, pyridazines and pyrazines. Chemistry of nucleic acids.	12

#### **Textbooks and References:**

1. K. Nakanishi, "Natural Products Chemistry Vol. I and II", Academic Press.
2. S. V. Bhat, B. A. Nagasampagi and M. Shivakumar, "Chemistry of Natural Products", Narosa Publishing House.
3. E. J. Corey and X.-M. Chelg, "The Logic of Chemical Synthesis", John Wiley & Sons.
4. J. A. Joule and K. Mills, "Heterocyclic Chemistry (Fifth Edition)", John Wiley & Sons.
5. T. L. Gilchrist, "Heterocyclic Chemistry", Pearson Education.
6. R. K. Bansal, "Heterocyclic Chemistry", New Age International.