Course Code	Course Name	Credits
26CH604	CHEMISTRY OF NATURAL PRODUCTS	04

Course Objectives

- This course in chemistry of natural products is to make students understand the versatile knowledge about the isolation, synthesis, biosynthesis and elucidation of various natural products and to acquire basic knowledge about the heterocyclic chemistry involving in natural products.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand the occurrence, isolation, biological importance, and classification of natural products such as alkaloids, terpenoids, and steroids.
- Explain structural features, stereochemistry, and biosynthetic principles of natural compounds including alkaloids, carotenoids, and flavonoids.
- Apply methods of structural elucidation and synthesis of key natural products like coniine, nicotine, menthol, cholesterol, and caffeine.
- Analyze the chemistry, structure, and applications of natural dyes, purines, and bioactive compounds in biological systems.

Unit 1 - Alkaloids (10 Hrs.)

ntroduction to Alkaloids; Occurrence of Alkaloids; Isolation of Alkaloids; Biological Functions of Alkaloids; General Methods of Preparation of Alkaloids; Structural Elucidation of Coniine; Structural Elucidation of Piperine; Structural Elucidation of Nicotine; Structural Elucidation of Papaverine.

Unit 2 – Terpenoids and Carotenoids (14 Hrs.)

Terpenoids – Introduction; Isoprene Rule; Structural Determination of Citral; Synthesis of Citral; Structural Determination of Menthol; Synthesis of Menthol; Structural Determination of Geraniol; Synthesis of Geraniol; Structural Determination of Camphor; Synthesis of Camphor; Carotenoids – Introduction; Geometrical Isomerism in Carotenoids; Structure Determination of β-Carotene; Synthesis of β-Carotene; Structure Determination of Vitamin A; Synthesis of Vitamin A.

Unit 3 - Anthocyanines and Flavones (12 Hrs.)

Introduction to Anthocyanines; Structure of Anthocyanines; General Methods of Synthesis of Anthocyanines; Cyanidin; Flavones – Introduction; Structure Determination of Flavone; Structure Determination of Flavonoids; Quercetin

Unit 4 – Purines and Steroids (14 Hrs.)

Purines – Introduction; Occurrence of Purines; Isolation of Purines; Biological Importance of Purines; Synthesis of Uric Acid; Structural Elucidation of Uric Acid; Synthesis of Xanthine; Structural Elucidation of Xanthine; Synthesis of Caffeine; Structural Elucidation of Caffeine; Steroids – Introduction; Stereochemistry of Steroids; Nomenclature of Steroids; Structural Determination of Cholesterol; Synthesis of Cholesterol; Structural Determination of Androgen; Synthesis of Androgen; Structural Determination of Estrogen; Synthesis of Estrogen

Unit 5 - Natural Dyes (10 Hrs.)

Occurrence of Natural Dyes; Isolation of Natural Dyes; Purification of Natural Dyes; Classification of Natural Dyes; Colour and Constitution of Natural Dyes; Structural Determination of Indigo; Synthesis of Indigo; Structural Determination of Alizarin; Synthesis of Alizarin

Reference Books:

1. L. Finar, Organic Chemistry, Vol-2, 5th edition, 1975, Pearson education, London.
2. O. P. Agarwal, Chemistry of Natural Products, Vol-1, 1997, Goel Publishing House.
3. Gurdeep Chatwal and Anand, Chemistry of Natural Products, 2001, Himalayan Publishing Co.
4. R. K. Bansal, Heterocyclic Chemistry; 3rd Ed., 1999, Wiley Eastern Ltd, New Delhi.
5. Koji Nakanishi, Toshio Goto and Sho Ito, Natural product chemistry, vol. I, 1974, Academies press.
6. A. A. Newman, Chemistry of Terpenes and Terpenoids. Ed. 1972, Academic Press, New York.

Websites and eLearning Sources:

1. https://nptel.ac.in/courses/104103068
2. https://www.youtube.com/watch?v=ObIYYIumghw&list=PL7rdlsr8tzIdr5FW1G80WX-FRRJf1pCPv

COs and Bloom's Taxonomy Mapping – 26CH604		
Course Outcomes	**On completing P.G. program the students will be able to**	**BTL**
CO1	Recall and understand the occurrence, functions, and isolation methods of alkaloids; the isoprene rule for terpenoids; synthesis of anthocyanins; the importance of purines; and the methods for natural dye purification.	K1, K2
CO2	Apply methods for the preparation, synthesis, and structural determination of alkaloids, terpenoids, anthocyanins, purines, and natural dyes.	K3
CO3	Examine and analyze techniques for the structural elucidation of alkaloids, carotenoids, flavones, steroids, and natural dyes.	K4
CO4	Evaluate the biological roles, synthesis, and applications of alkaloids, carotenoids, anthocyanins, flavones, steroids, and natural dyes, including their environmental impact.	K5
CO5	Design and create comparative analyses of alkaloid isolation, terpenoids vs. carotenoids, anthocyanins, purines vs. steroids, and natural dyes, focusing on synthesis methods, structural features, and applications.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26CH604												
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**					**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	1	1	2	3	2	2	1	2	2
CO2	3	3	3	1	1	1	3	2	2	3	2	2.18
CO3	3	3	3	1	1	2	3	2	3	3	2	2.36
CO4	2	3	2	1	1	1	3	2	2	3	3	2.09
CO5	2	2	3	1	1	2	3	2	3	2	3	2.18
											Total	2.16

Mean Score: 3- High, 2- Medium/Moderate, 1-Low