University of Kerala

Discipline	**CHEMISTRY**				
Course Code	**UK2DSCCHE104**				
Course Title	**BIOORGANIC CHEMISTY & COLLOIDS**				
Type of Course	**DSC**				
Semester	2				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	1. Higher secondary level science knowledge 2. First semester DSC (Chemistry) offered by UoK (preferable)				
Course Summary	The course covers topics in organic chemistry, including carbohydrates, lipids, enzymes, vitamins, hormones, steroids, amino acids, proteins, nucleic acids, colloids, soaps, and detergents, along with practical skills in qualitative analysis and experimental techniques. This knowledge will prepare students for further studies in organic chemistry, biochemistry, and related fields.				

Detailed Syllabus:

Module	Unit	Content BIOORGANIC CHEMISTY & COLLOIDS	Hrs
I	**CARBOHYDRATES**		**9**
	1	Classification with examples. Preparation and properties of glucose, fructose and sucrose	2
	2	Cyclic structures and Haworth projections of glucose, fructose and maltose (ring size determination not expected).	2
	3	Mutarotation, epimerization, Conversion of glucose to fructose and vice versa.	3
	4	Structure of starch and cellulose (Elucidation not expected). Industrial applications of cellulose.	2
II	**LIPIDS, ENZYMES, VITAMINS, HORMONES AND STEROIDS**		**15**
	5	Lipids: Classification – Oils, fats and waxes (definition, biological functions and examples). Hydrogenation and Rancidity - Acid value, Saponification value and Iodine value, biological functions of phospholipids and glycolipids	3
	6	Enzymes: Nomenclature, classification and characteristics. Mechanism of enzyme action. Theory of enzyme catalysis – Michaelis-Menten theory. Cofactors and coenzymes. Enzyme inhibitors. Uses of enzymes.	3
	7	Vitamins: Classification. biological functions and deficiency diseases of vitamins A, B1, B2, B3, B5, B6, B12, C and D (structure not required).	4

	8	Hormones: Introduction. Steroid hormones, peptide hormones and amine hormones, examples, and biological functions (structure not required). Artificial hormones (elementary study only).	3
	9	Steroids: Introduction and functions of cholesterol. Elementary idea of HDL and LDL. Bile acids	2
III	**AMINOACIDS, PROTEINS AND NUCLEIC ACIDS**		**12**
	10	Amino acids: Classification – Zwitter ion formation and isoelectric point- Synthesis of glycine and alanine (any one method). Peptides - Peptide bond.	4
	11	Proteins: Classification of proteins – Primary, secondary and tertiary structure of proteins -– Denaturation of proteins – Tests for proteins.	3
	12	Nucleic acids: Structure of pentose sugar, nitrogenous base, nucleoside and nucleotide – Double-helical structure of DNA – Differences between DNA and RNA.	2
	13	Biological Functions of DNA – Replication. Transcription and Translation. Genetic code. (Elementary idea only)	3
IV	**COLLOIDS, SOAP & DETERGENTS**		**9**
	14	Introduction, dispersed phase, dispersion medium, classification of colloids.	2
	15	Preparation - condensation and dispersion methods, purification - dialysis and ultra filtration	2
	16	Properties of colloidal solution- optical, kinetic and electrical properties, coagulation, Hardy-Schultz rule, protective colloid	2
	17	Applications of colloidal systems	1
	18	Soaps and Detergents: Soaps – Types of soaps. Cleansing action of soaps.	1
	19	Synthetic detergents - Classification. Comparison between soaps and detergents. Environmental aspects.	1
V	**PRACTICALS**		**30**
	20	**Section A: Organic Qualitative Analysis (Any 5 compounds with different functional groups are compulsory)** Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.	15
	21	**Section B (Open ended: Any 3 experiments are to be conducted - May be selected from the list or the teacher can add experiments)** 1. Preparation of derivatives of above analysed organic compounds 2. Identification of Carbohydrates: Glucose, fructose, sucrose and starch. 3. TLC - Separation and identification- Determination of Rf value of o-and p-nitroanilines,o- and p-chloroanilines, p-chlorophenol and	15

		p-nitrophenol, p-chloroaniline and p–nitroaniline, benzil and o-nitroaniline or any two amino acids. 4. Preparation of Soap	

References:

1. *Essential Organic Chemistry,* P.Y. Bruice, 1st Edition, Pearson Education, New Delhi.
2. *Organic Chemistry Vol. I & II,* I.L. Finar, Pearson Education, New Delhi.
3. *A Textbook of Organic Chemistry,* K.S. Tewari, N.K., Vishnoi and S.N. Mehrotra, Vikas Publishing House (P) Ltd., New Delhi.
4. *Modern Organic Chemistry,* M.K. Jain, S.C. Sharma, Vishal Publishing Co.
5. *Advanced Organic Chemistry,* A. Bahl and B.S. Bahl, S. Chand & Company, New Delhi.
6. *Biochemistry,* Rastogi, Tata Mc Graw – Hill Publication.
7. *Fundamentals of Biochemistry,* A.C. Deb, New Central Book Agency.
8. *Chemistry of Natural Products,* Bhat S.V., Nagasampagi, B.A. & Sivakumar M. Narosa.
9. *Vogel's Textbook of Practical Organic Chemistry,* Furniss, B.S.; Hannaford, A.J.; Rogers, V. Smith, P.W.G.; Tatchell, A.R. Pearson Education.
10. *Practical Organic Chemistry,* Mann, F.G.; Saunders, B.C. Pearson Education, 2009.
11. *Comprehensive Practical Organic Chemistry – Preparation and Quantitative Analysis,* Ahluwalia, V.K.; Aggarwal, R. Universities Press, 2000.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Attain an understanding of carbohydrate chemistry, equipping with knowledge applicable to fields such as biochemistry, nutrition and food science.	An	PSO-1&3
CO-2	Understand the basic ideas of lipid chemistry, enabling to apply in various fields such as nutrition, biochemistry and pharmaceuticals. Gain an understanding of enzyme kinetics and their significance in biological processes, biotechnology, and medicine.	An	PSO-1&3
CO-3	Equip with the basic ideas of biomolecules and prepare for further studies in biochemistry, molecular biology, and related fields.	An, E	PSO-2&3
CO-4	Basic understanding of colloidal chemistry to prepare for further studies in related fields, as well as for careers in industries where colloidal systems play a significant role.	An, C	PSO-2&3

CO-5	Proficiency in chemical tests to detect specific functional groups in organic compounds, to equip with essential skills for qualitative analysis in organic chemistry laboratories.	Ap, An	PSO-2&3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: BIOORGANIC CHEMISTY & COLLOIDS

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PO-2 PSO-1&3	An	C	L	
2	CO-2	PO-1 PSO-1&3	An	C, M	L	
3	CO-3	PO-3 PSO-2&3	An, E	C	L	
4	CO-4	PO-2 &3 PSO-2&3	An, C	C, M	L	
5	CO-5	PO-2 &6 PSO-2&4	Ap, An	C, P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	-	3	-	-	-	3	-	-	-	-	-	-
CO 2	2	-	2	-	-	2	-	-	-	-	-	-	-
CO 3	-	3	3	-	-	-	-	3	-	-	-	-	-
CO 4	-	2	2	-	-	-	2	2	-	-	-	-	-
CO 5	-	2	-	2	-	-	2	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	√	√		√
CO 2	√	√		√
CO 3	√	√		√
CO 4	√	√		√
CO 5	√		√	√