KU3DSCCHE215: CHEMISTRY OF BIOMOLECULES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200	KU3DSCCHE215	4	75

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture/ Tutorial	Practical/ Internship	CE	ESE	Total	
3	2	35	65	100	2

Course Description: The course demonstrates the structure of various biomolecules and the importance of stereochemistry on these structures. Also introduces various analytical techniques including spectroscopy.

Course Prerequisite: Basic idea in organic and biochemistry

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the importance of stereochemistry of compounds in determining their properties.	U
2	Comprehensive understanding on the structure and properties of carbohydrates	U
3	Understand the structural properties of proteins, nucleic acids and enzymes	U
4	Understand the basic principles of spectroscopy and will be able to analyse the structure of various molecules using suitable spectroscopic technique.	An
5	Able to analyse inorganic and organic samples qualitatively	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	0	0	0	0	0	0
CO 2	0	3	0	0	0	0	0
CO 3	0	0	3	0	0	0	0
CO 4	0	0	0	3	0	0	0
CO 5	0	0	0	0	3	0	0

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**STEREOCHEMISTRY**		**10**
	1	Isomerism – general – stereoisomerism – optical isomerism – chirality – plane polarized light – specific rotation – enantiomers – racemization – diastereomers – optical activity of lactic acid and tartaric acid – meso tartaric acid – resolution	
	2	Conformational isomerism – ethane, propane and cyclohexane – chair and boat forms- stability – geometrical isomerism – causes – maleic acid and fumaric acid – 1-butene and 2-butene stability	
2	**CARBOHYDRATES**		**10**

	1	Introduction – Definition and classification. Preparation and properties of Glucose, and Fructose (Fischer projection and Haworth structure of glucose and fructose)	
	2	Mutarotation – Epimers and Anomers- D and L configuration	
	3	Cane sugar – Structure and important properties	
	4	Polysaccharides: Starch, Cellulose and Chitin – structure, properties and tests	
3	**NUCLEIC ACID, PROTEINS AND ENZYMES**		**15**
	1	Classification – Purine and pyrimidine bases - structure of DNA and RNA	
	2	Functions of Nucleic Acids – DNA replication	
	3	Bio synthesis of Proteins – Test for DNA and RNA. Effect of hydrogen bonding in biological systems.	
	4	Classification of Amino acids – Physical and Chemical Properties – Zwitter ions – Iso Electric point – Sorensen formol titration – Chromatographic separation of amino acids	
	5	Peptides – Proteins classification, Primary, Secondary and Tertiary level structures of proteins – Tests for Proteins.	
	6	Enzymes-classifications-Mechanism of catalytic activity- Enzyme inhibition.	
4	**BASIC SPECTROSCOPY**		**10**
	1	Electromagnetic radiation, spectrum. Interaction with matter. Factors affecting shape and intensity of a spectral line	
	2	Absorption spectroscopy. Basic principle and application. Beer-Lamberts law. Bathochromic, hypochromic and hyperchromic shifts.	
	3	Fluorescence and phosphorescence. IR spectroscopy. Principle and application. Mass spectroscopy principle and application	

	TEACHER SPECIFIC MODULE -QUALITATIVE ANALYSIS *Directions: Total 7 experiments to be done. Analysis of a minimum of 6 cation mixtures to be recorded. In addition to this any one experiment related to the theory topics according to teachers' choice must also be done.*		**30**
	1	Inorganic qualitative analysis of cations (NH_4^+, Al^{3+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Mg^{2+})	
	2	**Open ended experiments**(suggestions)	
		1.Detection of sugar and amino acids	
		2.Estimation of proteins by biuret method	
		3.Estimation of reducing sugar by DNS (3,5-dinitrosalicylic acid) method	

Essential Readings:

1. David L. Nelson and Michael M. Cox; Lehninger Principles of Biochemistry
2. M. K. Jain and S. C. Sharma; Modern Organic Chemistry, Visal Publishing Company Co.
3. B. S. Bahl; Advanced organic Chemistry, S. Chand.
4. J. Clayden, N. Greeves, S. Warren and P. Wothers; Organic Chemistry, Oxford University Press
5. C. N. Banwell and E M Mc Cash; Tata Mc GrawHill, Fundamentals of molecular spectroscopy
6. D. L. Pavia, G. M. Lampman and G. S. Kriz; Introduction to spectroscopy
7. A. I. Vogel; A Textbook of Quantitative Inorganic Analysis.
8. V.V. Ramanujan; Semi-micro qualitative analysis.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation (ESE)		**65 (50T+15P)**
Continuous Evaluation (CCA)		**35 (25T+10P)**
Theory		**25**
a)	Test Paper*	10
b)	Assignment	5
c)	Viva-Voce	5
d)	Seminar	5
Practical		**10**
a)	Skill	4
b)	Record	4
c)	Punctuality	2
Total		**100**

*Average of best two test papers

Employability for the Course: The course enhances employability of the students by equipping them with essential knowledge and practical skills in chemistry