



**CALICUT UNIVERSITY – FOUR-YEAR UNDER
GRADUATE PROGRAMME (CU-FYUGP)**

BSc CHEMISTRY

Programme	B.Sc Chemistry				
Course Title	BIOORGANIC CHEMISTRY				
Type of Course	MINOR				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Fundamental Concepts of organic chemistry- Nomenclature, isomerism, Functional groups, Homologous series 2. Preliminary ideas of carbohydrates and Biomolecules				
Course Summary	This course explores basics of organic chemistry reaction mechanism, Reactions and mechanism of important functional groups, Chemistry of Carbohydrates, Biomolecules and natural products				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO 1	To understand the basic concepts of reaction mechanisms	U	C	Instructor-created exams / Assignment
CO 2	To realise types of organic reactions and intermediates	Ap	P	Instructor-created exams Assignment /quizes
CO 3	To understand how different functional groups confer distinct properties and reactivity, influencing the chemical behaviour of molecules	U	C	Assignment/Seminar
CO 4	To appreciate the importance of biomolecules in recognizing their central role in life processes	An	P	Instructor-created exams / Assignment
CO 5	To emphasize how organic chemistry provides a framework for unravelling	U	C	Group work /Assignment/class test

	the complexities of bio molecular structures.			
CO 6	To enable the students to develop analytical skills in organic qualitative analysis	Ap	P	Observation of practical skill/Viva voce
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	Basic concepts of Organic Chemistry.		15	30
	1	Introduction- Homolysis and Heterolysis with suitable examples. Curley arrow rules. Reagents – Electrophiles, nucleophiles and free radicals	2	
	2	Electron Displacement Effects: Inductive effect, Definition - Characteristics - +I and -I groups. Applications: Acidity of carboxylic acids-effect of substituents.	2	
	3	Electromeric effect: Definition – Characteristics - +E effect and - E effect - Addition of H ⁺ to ethene and addition of CN ⁻ to acetaldehyde.	1	
	4	. Mesomeric effect: Definition, Characteristics - +M and -M groups. Applications: Comparison of electron density in benzene,nitrobenzene, Phenol and Aniline	3	
	5	Hyperconjugation effect: Definition – Characteristics. Applications: comparison of stability of But-1-ene and But-2-ene.	1	
	6	Steric effect	1	
	7	Reaction intermediate:Type ,shape and stability of Carbocations, carbanions and free radicals.	3	
	8	Types of organic reactions: Addition, Elimination, Substitution, Rearrangement and Redox reactions-Defintion and one example	2	
II	Chemistry of carbonyl compounds and amines		10	22
	9	Aldehydes & Ketones: Preparation from alcohols –Comparison of reactivity of aldehydes and ketones. Nucleophilic addition reactions-addition of HCN and bisulphite.	3	
	10	Carboxylic Acids: Preparation from Grignard reagent – Decarboxylation – Kolbe electrolysis	2	
	11	Amines: Preparation from nitro compounds – Hofmann’s bromamide reaction – Hofmann’s carbylamines reaction. Basicity: Comparison of basicity of ammonia, methylamine and aniline	3	
	12	Diazonium salts: Preparation and synthetic application of benzene diazonium chloride	1	

	13	Preparation and uses of methyl orange	1	
III	Carbohydrates		10	23
	14	Classification- Monosaccharides, oligosaccharides, and polysaccharides, Aldose and Ketose, reducing and nonreducing sugars	2	
	15	Cyclic structure of Ribose, Deoxy ribose. glucose and fructose.	2	
	16	D and L forms of glyceraldehyde, Glucose - manufacture of glucose from starch, physical properties, uses, Structure of D and L glucose	2	
	17	Analytical test for glucose - effect of heating, effect of conc sulphuric acid, Fehling's test, Tollens test, Molisches test.	1	
	18	Fructose- preparation from cane sugar, properties. Sucrose - manufacture of sucrose from sugar cane juice. Starch and cellulose - physical properties, structure (Basic ideas only)	3	
IV	Proteins and Nucleic acids		10	23
	19	Amino acids – Classification – Structure of amino acids – Zwitter ion formation – Isoelectric point. Peptide linkage, polypeptides and proteins. Primary, secondary and tertiary structure of proteins. Denaturation of proteins. Tests for proteins: Xanthoprotein test, Biuret test and Ninhydrin test.	3	
	20	Enzymes, characteristics and examples	1	
	21	Nucleic acids: Introduction, constituents of nucleic acids – nitrogenous bases, nucleosides and nucleotides. Double helical structure of DNA. Difference between DNA & RNA – DNA finger printing and its applications	3	
	22	Lipids: Classification- Fats and oils. Biological functions of lipids. Steroids : classification. Structure and biological functions of cholesterol, testosterone and progesterone. Elementary idea of HDL and LDL	3	
V	PRACTICALS RELATED TO THE MODULE II and III		30	
	1	Reactions of Organic Compounds	4	
	2	II. Functional groups test for 1. Phenols -Phenol 2. Amines-Aniline 3. Aldehydes and ketones -benzaldehyde, benzophenone). 4. Carboxylic acid (benzoic acid, cinnamic acid). 5. Carbohydrates (glucose). 6. Amides (benzamide, urea	20	
	3	III. Preparation of organic compounds-	6	

References

1. Morrison, R. N. & Boyd, R. N., Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Bhal and Bhal, Advanced Organic Chemistry, 2nd Edition, S. Chand Publisher, 2012.
3. I. L. Finar, *Organic Chemistry*, Vol. I, 5th Edn., Pearson Education, New Delhi, 2013.
4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, 3rd Edn., Vishal Publishing Company Co., 2010.
5. K. S. Tewari, N. K. Vishnoi, S. N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edn., Vikas Publishing House, New Delhi, 2004.
6. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edn., Pearson Education, Noida, 2014.
7. F. G. Mann, B. C. Saunders, *Practical Organic Chemistry*, 4th Edn., Pearson Education, Noida, 2011.
8. Arthur I. Vogel, *Elementary Practical Organic Chemistry- Small Scale Preparations*, 2nd Edn., Pearson Education, Noida, 2013

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	-	2	-	1	-	2			1	2	1	
CO 2	2		2	-	-	1	2			2	1	1	
CO 3	2	-	2	-	2	2	2			2	1		
CO 4	2	-			2		2			2	1		
CO 5	2		-	-	2	-	2			2	1		
CO 6	2	-	2		-	2	2		1		2		1

Correlation Levels:

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

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Practical exam (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Seminar/Group Discussion	Quizzes/viva	Observation Of practical Skill	End Semester Examinations
CO 1	✓	✓				✓
CO 2	✓	✓		✓		✓
CO 3	✓		✓			✓
CO 4		✓				✓
CO 5		✓	✓			✓
CO 6				✓	✓	✓