DEPARTMENT OF MICROBIOLOGY				*CLASS: II B.Sc. Microbiology*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
III	Major Core - 5	20U3RMC5	Biochemistry	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To understand the basic building blocks of living organisms
2. To introduce the structure and properties of various biomolecules
3. To emphasis on the association between structure and function of various biomolecules
4. To learn the concepts involved in the mechanism of enzyme action
5. To understand the significance of vitamins as vital ingredient of life

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Acquaint with chemical and molecular foundations of life and appreciate the role of water in biological systems
2. Comprehend the structure, function and properties of carbohydrates, amino acids and lipids
3. Introduce the significance of carbohydrates, proteins and lipids in biological systems
4. Aware of the importance of vitamins in biological systems
5. Elaborate the mechanism of enzyme action

Unit	**Description**	**Hours**	**K-level**	**CLO**
I	**Unit - I: Water and Carbohydrates** Water: The solvent of life - physical properties and structure of water molecule. pH and Buffers.Carbohydrates–definition, structure and classification. Physical andchemical properties of Monosaccharides- Glucose, Disaccharides- lactose, Polysaccharides – starch. Biological significance of carbohydrates.	15Hrs	Up to K2	1
II	**Unit - II: Amino acids and Proteins** Amino acids – Structure and classification. Properties – physical andchemical.Uncommon amino acidsand their functions. Proteins – definition, classification based on composition and solubility. Structural levels of organization – primary, secondary, tertiary and quaternary structure and their functions.	15Hrs	Up to K3	2

III	**Unit - III: Enzymes** Enzymes –definition and nomenclature.IUB classification with examples. Mechanism of enzymeaction-lock and key model. Enzyme inhibition-competitive and non-competitive. Factors affecting enzymes activity.	15Hrs	Up to K3	3
IV	**Unit - IV: Lipids** Lipids – definition ,classification and physical and chemical properties. Saturated and unsaturated fatty acids. Plant steroids. Biological significance of lipids. Lipid metabolism - β-oxidation, biosynthesis of saturated fatty acid eg. Palmitic acid.	15Hrs	Up to K3	4
V	**Unit - V: Vitamins and Hormones** Vitamins- Source and importance of vitamins. Classification - water soluble vitamins (Vitamin B and C).Fat soluble vitamins (Vitamin A, D, E and K). Vitamin deficiency diseases and symptoms. Hormones: Definition, Chemical classification of hormones. Functions of hormones and their regulation	15Hrs	Up to K4	5

Total 75 Hours

Books for Study

1. Jain, J. L. (2000). Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi

Books for Reference

1. Nelson, D.L., and Cox,M.M., (2000). LehningerPrinciples of Biochemistry, Third edition, Macmillan Worth publishers. London
2. David, B.D., Delbecco,. R., Eisen, H.N and Ginsburg, H.S (1990). "Microbiology" 5th Edition. Harper & Row, New York.
3. Stryer. L. (1995). Biochemistry, 4th edition , W.H. Freeman &Co. NY.
4. RoberMurray,K., Daryl Grammer, K., (1990).Harper's Biochemistry, 25th edition, McGraw Hill, Lange Medical Books,New York.
5. Satyanarayana, U (2005). Essentials of Biochemistry, Books and Allied (P) Ltd., Kolkata.
6. Veerakumari, L (2004). Biochemistry. MJP Pubilshers, A Unit of Tamil Nadu Book House, Chennai.

Web Resources

1. https://bio.libretexts.org/Bookshelves/Biochemistry
2. https://www.edx.org/course/principles-of-biochemistry
3. https://online-learning.harvard.edu/course/principles-biochemistry
4. https://courses.lumenlearning.com/introchem/chapter/protein-structure
5. https://www.medicalnewstoday.com/articles/319704

Rationale for Nature of the course

The goal of this course is to understand the basic building blocks of living organisms, its structure and propertiesand to emphasize on the association between structure and function of various biomolecules. This course highlights on the concepts involved in the mechanism of enzyme action and to understand the significance of vitamins as a vital ingredient of life.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Providing knowledge on biomolecules, and their significance in the metabolism
- Exploring the structure of biomolecules found in cells and to determine their structures.
- Inculcatingthe formulation of biomolecules such as enzymes, hormones and vitamins in drug designing.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcome On successful completion of the programme, the students will be able to	Knowledge Level
CLO1	Acquaint with chemical and molecular foundations of life and appreciate the role of water in biological systems.	Up to K2
CLO2	Comprehend the structure, function and properties of carbohydrates, amino acids and lipids.	Up to K3
CLO3	Introduce the significance of carbohydrates, proteins and lipids in biological systems.	Up to K3
CLO4	Aware of the importance of vitamins in biological systems.	Up to K3
CLO5	Elaborate the mechanism of enzyme action.	Up to K4

K1 –Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving Problems
K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	2
CLO3	2	2	3	2	3
CLO4	3	2	2	2	2
CLO5	2	2	2	3	2

Advance application–3 Intermediate level –2 Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	3
CLO3	3	2	2	2	2
CLO4	2	2	3	2	2
CLO5	3	2	2	2	2

Advance application–3 Intermediate level –2 Basic level –1

Learning Outcome Based Education & Assessment (LOBE) - Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving Problems
K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.8	**41.6%**
K2	5	6	10	10	**31**	25.8	
K3	-	-	20	30	**50**	41.7	**41.7%**
K4	-	-	10	10	**20**	16.7	**16.7%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I Water and Carbohydrates	a) Water: The solvent of life - physical properties and structure of water molecule		1	PPT
	b) pH and Buffers		3	
	c) Carbohydrates- definitions, classification, structure		2	
	d) Physical and chemical properties of Carbohydrates		3	
	e) Physical and chemical properties of - Monosaccharides – Glucose. Disaccharides- lactose		3	
	f) Polysaccharides – starch. Biological significance of carbohydrates		3	
II Amino acids andProteins	a) Amino acids – Structure and classification.		3	PPT
	b) Properties – physical and chemical		3	
	c) Uncommon amino acids and their functions		2	
	d) Proteins – definitions, classification based on composition, solubility		3	
	e) Structural levels of organization – primary, secondary, tertiary and quaternary structure and functions		4	
III Enzymes	a) Enzymes –definitions, nomenclature,IUB classification with examples		5	PPT
	b) Mechanism of enzyme action-lock and key model		2	
	c) Enzyme inhibition-competitive and non-competitive		4	
	d) Factors affecting enzymes activity.		4	
IV Lipids	a) Lipids - classifications, physical and chemical properties, saturated and unsaturated fatty acids.		5	PPT
	b) Plant steroids. Biological significance of lipids		3	
	c) Lipid metabolism - β-oxidation,		2	
	d) biosynthesis of saturated fatty acid eg. Palmiticacid.		5	
V Vitamins and Hormones	a) Vitamins- Source and importance of vitamins		2	PPT
	b) Classification– water soluble vitamins (Vitamin B and C).		3	
	c) Fat soluble vitamins (Vitamin A, D, E and K).		3	
	d) Vitamin deficiency diseases and symptoms.		2	
	e) Hormones: Definition, Chemical classification of hormones		3	
	f) Functions of hormones and their regulation.		2	
Total			**75 Hrs**	

Course designers

1. Dr.A.P.Ashakannan