University of Kerala

Discipline	**BOTANY**				
Course Code	**UK2DSCBOT105**				
Course Title	**BIOMOLECULES**				
Type of Course	**DSC**				
Semester	**II**				
Academic Level	**100-199**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	04	03 Hours	-	02 Hours	05 Hours
Pre-requisites	No Pre-requisites				
Course Summary	Biomolecules are components that interact in complex ways to form the basis of life. The molecular components include water, carbohydrates, lipids, amino acids, proteins, and nucleic acids. Studying the types, structure, and significance of these molecules will make you understand the role of biomolecules in metabolism and how the molecules are involved in the biochemical activities of living things.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Biomolecules**	**06**
	1	Water- properties-weak interactions in aqueous systems-hydrogen bonding-Van der Waals forces-hydrophobic interactions	
	2	Ionization of water-pH-weak acids and weak bases-Henderson–Hasselbalch equation	
	3	Buffers in the biological system- phosphate buffer-bicarbonate/carbonic acid system	
II		**Carbohydrates**	**07**
	4	Monosaccharides- Glucose-Fructose-aldoses- ketoses-isomerism-cyclic structures-pyranoses-furanoses	
	5	Disaccharides-- glycosidic bonds-sucrose- lactose-reducing and non-reducing sugars-Oligosaccharides	
	6	Polysaccharides- Homo and Hetero polysaccharides-Structural polysaccharides - cellulose, peptidoglycans; storage polysaccharides -Inulin and starch; biological importance of carbohydrates	
III		**Proteins**	**08**
	7	General structure-zwitter ion-isomerism	
	8	Classifications of aminoacids, D-aminoacids- biologically active aminoacids	
	9	Peptides-peptide bond-oligopeptide-polypeptide.	

	10	Proteins- structure-primary-secondary-super secondary-motifs and domains (brief account)-tertiary-quaternary-structure-functions of proteins.	
IV	**Lipids and Nucleic acids**		**09**
	11	Classification of lipids-Fatty acids- saturated/unsaturated-mono/poly-triacyl glycerols	
	12	Membrane phospholipids- glycerophospholipids- sphingolipids-lipid bilayer- Steroids-cholesterol	
	13	Nucleic acids- nucleoside-nucleotide, Polynucleotides-phosphodiester bond, DNA - types (B-DNA, A&Z DNA (brief account); RNA- mRNA, rRNA, t-RNA, minor RNAs (brief account), significance of nucleic acids.	
V	**Secondary Metabolites**		**15**
	14	Introduction, Classification, Major secondary metabolites in plants.	
	15	Phenolics, lignins, flavonoids, tannins, terpenes, saponins, carotenoids and alkaloids	
	16	Function and significance of secondary metabolites.	

Practicals		
	1. Measurement of pH 2. buffer preparation (Phosphate buffer) 3. Tests for carbohydrates- Iodine, Molisch's test, Benedict's, Fehling's test. 4. Qualitative test for proteins- biurette test 5. Separation of aminoacids using paper chromatography (demonstration). 6. Isolation of DNA from a plant source (Demonstration).	**30**

Suggested Reading

1. Lehninger, Principles of Biochemistry, Eighth Edition,2022.
2. Lubert Stryer, Biochemistry, 2022.
3. Dey, P.M..Harborne, Plant Biochemistry, 1997
4. Conn, E.E, Stumpf,P.K., Bruening,G. and Doi, R.H., Outlines of Biochemistry 5th edition, Wiley India Ltd., N.Delhi.
5. Primrose, S.B., 1987, Modern Biotechnology, Black Well Scientific Publications, Oxford
6. Jain, J.L., Jain, S., and Jain, N., Fundamentals of Biochemistry, S.Chand& Company.

Web link

1. https://www.mcgill.ca/biochemistry/about-us/information/biochemistry
2. https://biochemistry.org/education/careers/becoming-a-bioscientist/what-is-biochemistry/
3. https://www.britannica.com/science/biochemistry
4. https://www.nanowerk.com/nanobiotechnology.ph

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the importance of water and buffers in the metabolism of living things. Gain skill in using pH meter and the preparation of buffers.	U, An	PSO-1,2
CO-2	Recall various carbohydrates present in plants. Differentiate the structure and significance of common mono, di and polysaccharides in plants. Learn to analyse the presence of carbohydrates in a given sample.	R, U, An	PSO-1,2
CO-3	Understands the structure and significance of proteins, amino acids, and peptides. Acquire skill in qualitative analysis of proteins and separation of amino acids through chromatography.	U, An	PSO-4
CO-4	Understand the role of fats, and sterols in our metabolism and diet. Describe the structure of nucleic acids and lipids. Attain skill in the isolation of DNA from plant samples.	U, An	PSO-4
CO-5	List out different classes of secondary metabolites and describe the importance of secondary metabolites in plant defense mechanisms and phytomedicines.	U	PSO-7

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

Name of the Course: Biomolecules

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

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	1	1,2	U, R	F, C, P	L, T	P
2	2	1,2	U, R	F, C, P	L, T	P
3	3	4	U, R	F, C, P	L, T	P
4	4	4	U, An	F, C, P	L, T	P
5	5	7	U, Ap	F, C	L, T	-

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

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		✓		✓