

**Objective:** To provide students with a systematic approach of molecules of living systems and their biological functions and applications.

**Credits Earned:** 6 Credits

**Course Outcomes:** After completion of this course, student will be able to

1. Understand and identify the biomolecules, their basic structure and composition.
2. Classify and characterize biomolecules and their subtypes based on their properties.
3. Examine and illustrate chemical reactions, biological interactions and analytical tools to study them.
4. Determine various biological functions and examine applications of biomolecules in various fields.

**Pre-requisite of course:** NA

#### Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Practical	
5	0	2	6	50	30	20	25	25	150



**Contents:**

<b>Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Introduction to Biochemistry</b> Chemical reactivity, Noncovalent interactions, Types of Chemical reactions (Substitution, Addition, Elimination, Rearrangement, Oxidation, Reduction, etc.), Solvent-Solute, Properties of Water, Concept of pH of weak acids, weak bases & buffer, strength of buffer, Thermodynamics and Reaction Kinetics.	11
2	<b>Carbohydrates:</b> Classification, Types & Properties of Mono-, Oligo- and Polysaccharides, Physical, Chemical & Optical Properties of Sugars, Sugar Derivatives, Biological Functions & Applications, Estimation of Carbohydrates.	12
3	<b>Amino Acids &amp; Proteins:</b> Classification, Structural Features, Chemical Reactions & Properties of Amino Acids, Proteins, Peptide linkage, Protein Folding, Primary, Secondary, Tertiary, Quaternary structures of Proteins, Protein Motifs & Domains, Structural Classification of Proteins, Proteins Modifications, Biological functions, Applications; Protein Detection & Estimation.	15
4	<b>Nucleic acids:</b> Classification & Structural Features, Nitrogenous bases, Nucleosides, Nucleotides; Phospho-diester linkages; Pairing of Bases; Structure of DNA (A, B and Z forms) and RNA (tRNA, rRNA, mRNA, siRNA, microRNA), Biological Functions, Applications; Estimation & Detection of Nucleic Acids; Nucleic acid Sequencing & Synthesis. <b>Lipids:</b> Classification, Structural Features & Types of Lipids & Fatty Acids, (Saturated, Unsaturated, Branched, Nomenclature, System Structure and Triglycerides, Phospholipids, Sphingolipids, Terpenes, Prostaglandins, Waxes, Steroids) Biological Functions, Applications; Detection and Estimation of Lipids. <b>Vitamins:</b> Structure and Function of Vitamins.	22
	<b>Total Hours</b>	60

**References:**

1. Lehninger's Principles of Biochemistry, 6<sup>th</sup> edition, (2013) by David L. Nelson and Michael M. Cox; W. H. Freeman.
2. Fundamentals of Biochemistry, (2016) 5th Edition, Donald Voet, Judith G. Voet, W. Pratt; Wiley publishers.
3. Biochemistry (2013), 4th Edition by U. Satyanarayana, Elsevier.
4. Physical biochemistry: Principles and applications (2009), 2nd Edition, by David Sheeham; John Wiley and Sons.
5. Physical biochemistry: Applications to Biochemistry & Molecular Biology, (1982), by David Freifelder; W. H. Freeman.

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	15%	10%	5%

**Instructional Method:**

- g. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.
- h. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.
- i. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

**EXPERIMENTS:**

1. Qualitative Determination of Carbohydrates
2. Quantitative Estimation of Carbohydrates (DNSA, Orcinol, etc)
3. Qualitative Determination of Amino Acids
4. Quantitative Estimation of Proteins (Biuret & Folin Lowry method)
5. Quantitative Estimation of Nucleic Acids (UV, Orcinol and DPA METHOD)
6. Quantitative Estimation of Vitamins
7. Isolation of Proteolytic Organisms
8. Isolation of Lipolytic Organisms