

## B.Sc. Semester– II

### Discipline Specific Course (DSC)

**Course Title: - Bio-molecules and Bio-analytical techniques**

**Course Code:C2BIT1T1**

**Course Outcomes (COs): At the end of the course students will be able to:**

- CO1: Understand the Basic concepts of Biochemistry.
- CO2: Attain knowledge of Biomolecules , their Classification, Structure and Properties.
- CO3: Learn the concept of Vitamins and importance in our diet.
- CO4: Acquire the knowledge of hormones and their functions.
- CO5: Understand the metabolic pathways and oxidation-reduction reactions.
- CO6: Learn the working principle of analytical instruments and their applications.

Unit	Title: Bio-molecules and Bio-analytical techniques (Credits: Theory-4, Practicals-2)
Unit 1	1.1: Introduction – Structure and properties of water, pH, biological buffer system, Henderson and Hassel Balch equation. Isotopes and indicators. 1.2: Carbohydrates– Classification of carbohydrates, Structure , function and properties of Monosaccharide , Disaccharides and Polysaccharides. Bacterial cell wall polysaccharides. 1.3: Proteins– Introduction, sources, classification, structure and properties of amino acids. Concept of Zwitterions, isoelectric points, pKa values. Classification of proteins . 1.4:Organization of proteins - Primary, Secondary, Tertiary and Quaternary structures. Stability of proteins. Biological function of proteins. Structural importance of Glycoproteins, Myoglobin and Haemoglobin.
Unit 2	2.1: Lipids– Introduction, sources, classification, properties (saponification value, acid value, iodine number, rancidity). Functions of lipids, hydrogenation of fats and oils. Saturated and unsaturated fatty acids. General structure and biological functions of Glycolipids, Phospholipids. Sphingolipids, Lipoproteins, Metabolism-Beta oxidation of fatty acids, biosynthesis of cholesterol. 2.2: Enzymes– Introduction, Nomenclature and Classification, Properties, factors influencing enzyme catalyzed reactions, activation energy and transition state , enzyme activity and specific activity, coenzymes, Co- factors, Induced fit theory and lock and key enzyme mechanism, enzyme kinetics . 2.3:Enzyme inhibition – irreversible and reversible (competitive, non-competitive, and uncompetitive inhibition with an example each). Industrial applications of enzymes.
Unit 3	3.1: Vitamins Dietary sources and biological role of vitamins. Water soluble and fat-soluble vitamins. Deficiency manifestation of vitamin A, B, C, D, E and K. 3.2: Hormones- Chemistry and functions of pituitary and gonadal hormones. 3.3: Bioenergetics Concept of energy transformations. redox potentials. 3.4: Metabolism – Glycolysis and Gluconeogenesis, Krebs cycle and Electron Transport system.
Unit 4	Bioanalytical tools 4.1: Spectroscopy – Principle procedure and application of Colorimeter, UV- visible spectroscopy , Mass spectroscopy . 4.2: Chromatography – Principle, procedure and application of Paper Chromatography , Thin layer chromatography, Gas chromatography, High performance liquid chromatography and Ion Exchange chromatography. 4.3: Electrophoresis – Principle, procedure and Applications of Paper electrophoresis, Agarose gel electrophoresis and SDS-PAGE .

### **Recommended books:**

1. Voet and Voet, Dand, J.G. Voet (2004) Biochemistry, John Wiley and sons.
2. Strayer. L. (2000) Biochemistry, 5<sup>th</sup> edn. W. H Freeman and company New York.
3. Boyer, R (2002) Concepts in Biochemistry. 2<sup>nd</sup> edn –Brooks /Cole, Australia.
4. Montgonary, R.M, Conway, T.W-and Spectator, A. A, (1996) Biochemistry-A Case– Oriented Approach 6<sup>th</sup>edn, Mosby Inc, Missouri.
5. Roa, CNR, (1999) Understanding chemistry, University press Hyderabad.
6. Nelson, D. L., and Cox,M. M. (2001) Biochemistry Mac Milan worth Publishers. Hampshire.
7. Zubey, G. L, Pason, W. W,and Vance, D. E.(1995) Principles of Biochemistry WMC. Brown Publishers, Oxford.
8. Devlin, T. M. (1997) Textbook of Biochemistry with Clinical correlations, Wiley and sons, Inc New York.
9. Garret and Grashem (1999) Biochemistry Saunders College Publishers.
10. Knowler and Leader. The Biochemistry of the nucleic acids. 11<sup>th</sup>ednChapman and Hall.
11. Horton, R. Het. al. (1996) principles of Biochemistry. Prentice Hall, International, Inc, New Jersey.
12. William, H. Elliot and Dophince, C. Elliot (3<sup>rd</sup>edn) Biochemistry and molecular Biology. Oxford Publication.
13. David. E. Metlezer.(2002) Biochemistry Vol1 and Vol2, Elsevier Publication
14. Wilson and Walker (2009) Practical Biochemistry– Principles and techniques, Cambridge University Press, Cambridge, U.K.
15. Chatterjee and Shinde, textbook of medical biochemistry, jaypee Publications
16. Satyanaraya, U. (2021). Biochemistry, 6 e-E books. Elsevier health sciences.
17. Campbell, M.K., Farrell, S. O., and Mc Douggal, O.M. (2016). Biochemistry. Cengage Learning.
18. Walker. J. M., (2000). Principle and techniques of Practical biochemistry, Cambridge University Press.

# B.Sc. Semester-II

## Discipline Specific Course (DSC)

### Course Title: - Bio-molecules and Bio-analytical techniques.

Course Code:C2BIT1P1

#### Course Outcomes (COs): At the end of the course, students will be able to:

- CO1: Acquiring knowledge about Biomolecules, structure and their function
- CO2: Explain the metabolic pathways.
- CO3: Apply comprehensive innovation and skills of Biomolecules to Biotechnology field.
- CO4: Understand enzymes, proteins and their assay methods using colorimeter.
- CO5: Attain skills to perform techniques of chromatography and electrophoresis .

#### List of the Experiments, each will have 04Hrs / Week

1. Preparation of Percent, Molarity, Molality and Normality of solution. Dilution of concentrated solutions.
2. Screening of pH of different samples
3. Preparation of different types of buffers- acetate , phosphate, and tris buffer.
4. Qualitative analysis of carbohydrates and amino acids.
5. Paper chromatography of amino acids
6. Determination of acid number of an edible oil
7. Determination of Saponification number of edible oil
8. Study of detergent haemolysis in animal cells (Blood of frog and human)
9. Assay of amylase activity.
10. Estimation of proteins by Biuret method and Lowry's method.
11. Estimation of reducing sugar/maltose by DNS method.
12. Study of acid phosphatase and alkaline phosphatase activity.
13. Determination of Iodine number of lipids
14. Study of analytical instruments – Colorimeter, Centrifugation, Chromatography, Electrophoresis.