

Course Code	Course Name	Credits
26ZY506	BIOCHEMISTRY	04

Course Objectives

- To understand the fundamental concepts and principles of biochemistry.
- To explain the structure and functions of biomolecules such as carbohydrates, proteins, lipids, and nucleic acids.
- To develop knowledge on enzyme action, metabolism, and biochemical pathways.
- To analyze the biochemical basis of physiological processes in living organisms.
- To enhance analytical and practical skills related to biochemical techniques and applications.

Learning Outcomes

- Explain the structure, properties, and functions of major biomolecules.
- Differentiate various metabolic pathways and their biological significance.
- Examine enzyme mechanisms and factors affecting enzyme activity.
- Analyze biochemical processes involved in cellular and physiological functions.
- Apply biochemical knowledge and laboratory skills in biological and research studies.

Unit 1 – Basic concepts (12 Hrs.)

structure of atom and molecule; types of chemical bonds including ionic, covalent and hydrogen bonds; properties of pH, and buffers; carbohydrates – structure, classification and functions; proteins – amino acids, peptide bonds, structure and functions; lipids – classification and biological importance; Enzymes – classification, mechanism of enzyme action and factors affecting enzyme activity, coenzymes and cofactors

Unit 2 – Bioenergetics (12 Hrs.)

Energy flow cycle, thermodynamic laws. High energy compounds, structure and properties of ATP, biological oxidation - Electron transport chain, ATP synthesis. Oxidative phosphorylation. Energetics, energy balance sheet, oxidative stress. Photosystems and photophosphorylation (synthesis of ATP and NADPH), Inhibitors of oxidative phosphorylation,

Unit 3 - Metabolism of carbohydrate (12 Hrs.)

Glycolysis –metabolism. Aerobic and anaerobic pathway and regulation, TCA cycle, NADPH Cycle, Calvin Cycle, Glyoxylate cycle, Pentose Phosphate Pathway. Gluconeogenesis – regulation of gluconeogenesis. Glycogenesis and glycogenolysis, their regulation. Disorders of carbohydrate (lactose intolerance, galactosemia, diabetes). Carbohydrate Metabolism. Glycolysis: Steps and Energetics of Glycolysis, Glycogenesis, Glycogenolysis and Gluconeogenesis, Kreb's Cycle

Unit 4 – Metabolism of lipid (12 Hrs.)

Digestion, Mobilization and transport of fats, Biosynthesis of palmitic acid, and biodegradation of triglycerides and fatty acids (beta oxidation). Physiology of lipids/lipoproteins and apolipoproteins. Disorders of Lipid metabolism (atherosclerosis, ketone bodies (acidosis- alkalosis), Gaucher disease and LDL-hypercholesterolemia). Beta Oxidation of Fatty Acids

Unit 5 - Metabolism of Amino acids & Nucleic acids (12 Hrs.)

Biosynthesis of essential amino acids: Lysine, Phenylalanine and Glutamine. Biodegradation of amino acids, deamination, transamination and urea cycle. Disorders of amino acid metabolism (phenylketonuria, alkaptonuria, tyrosinemia and maple syrup urine disease). Biosynthesis, biodegradation, and regulation of Purines, pyrimidines, Disorders of nucleic acid metabolism (Gout, leshnyhn syndrome, hyper and hypo uricemia, adenosine deaminase deficiency).

Reference Books:

1. Principles of Biochemistry, Donald Voet, Judith G. Voet, Charlotte W. Pratt, 4th Edition, John Wiley & Sons, 2012.
2. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox, 67h Edition, W.H. Freeman, 2017.
3. Biochemistry, U Satyanarayana, 5th Edition Books & Allied Ltd., 2017.
4. Biochemistry, Denise Ferrier, Lippincott, Williams & Wilkins, 2017.
5. Kennelly, P. Anthony Weil, Thirty-First Edition (A & L LANGE SERIES), 2018.

Websites and eLearning Sources:

<https://openstax.org/details/books/biology-2e>
<https://www.biologydiscussion.com/biochemistry>
<https://www.easybiologyclass.com/category/biochemistry/>