Course Structure for
Principles of Biochemistry

Part A

1. *Chemical Basis of Life*
2. Elixir of Life on Earth – Water, the medium of all Biohemical Processes. The physical and chemical properties of water at the root of life processes..
3. Cell – the unit of life where biochemical processes occur during birth, life and death of cell.
4. Physical and Chemical Principles underlying the Biochemistry in the cell
5. Introduction to the Chemistry of three major components of cell – Proteins, nuleic acids and carbohydates.
6. Chemistry of small molecules necessary for the cell to survive and function
7. Chemistry of biomembranes in different classes of cells.
8. Types of Chemical Reactions occurring in the cell – redox, addition, substitution, hydrolysis and proteolysis, disproportionation and free radical. *Concept of Free energy coupling of different chemical pathways in cell.*

Part B

1. Proteins - Composition and Structure
   Primary, secondary, tertiary and quarternary structures.
   Structure function correlation in proteins.
   Experimental methods to find these structures and use of pymol and artificial intelligence to predict the structure of the proteins.
   Preliminary concepts of Enzymolgy and enzyme kinetics to understand a major function of proteins in the cell.
   Biochemical Basis of Immune Function
2. Nucleic acids, DNA and RNA – *Chemistry and Structure*
   Chemical Synthesis of nucleic acids.
   Chemical Basis of Genes and Genetic Code
3. Carbohydrates , structure and the role in the cell. Carbohydrate binding proteins.
4. Lipids and Cell Membranes

Part C

1. Metabolisms to keep the cells functional . Diseases related to faulty metabolism.

Part D

Basic introduction to Neurochemistry.

Practical: Biochemistry

Purification of Proteins and Nucleic Acids
Bench Side Techniques : Ammonium Sulfate Fractionation, Gel Filtraion, Ion-exchange chromatography,Gel Electrophoresis.
Instruments: Fast Protein Liquid Chromatography and /or High Performance Liquid Chromatography . (FPLC or HPLC)
Separation of proteins and nucleic acids in nucleoprotein complex like chromatin.
Size determination and characterization of proteins and nucleic acids by gel electrophoresis and gel filtration.

Estimation of Proteins and Nucleic Acids by spectrophotometry (e.g. Lowry Method) and spetrofluoremetry

Simple Spectroscopic studies of the conformational transitions and denaturation of proteins and nucleic acids

Enzymatic assays with simple enzymes like BAP.

Quantitative Characterization of interaction of small ligands with Proteins and Nuleic Acids (studies of chemical equilibrium by different spectroscopic techniques, Isothermal Titration Calorimetry and Surface Plasmon Resonance Spectroscopy).

Characterization of interaction between different proteins and self association of proteins

Studies of interaction between proteins and nucleic acids.

Details of the experiments will be decided after checking the availability of the instruments. Proteins to be studied are those which are easily accessible like RNase, Histones, commonly available enzymes like lysozyme, BAP etc.