	Brief Syllabus
Chemistry of biomolecules	The versatility of carbon bonding, covalent, ionic, coordinate, and hydrogen bonds, van der Waals, hydrophobic, interactions; Carbohydrates; Simple sugars to complex polysaccharides and glycoconjugates, roles in energy storage and cellular recognition. Amino acids, R groups, proteins, biosynthetic and chemical synthesis; Lipids, including fatty acids and phospholipids, signaling molecules and structural components with implications in health and disease. Nucleic acids, primary, secondary, tertiary structures and composition; Secondary metabolites, terpenoids, alkaloids, and antibiotics, biosynthetic pathway. Biochemical methods: chromatography and electrophoresis, paper chromatography, gel electrophoresis, and high-pressure liquid chromatography.
Genetics	Basic Concepts of Genetics: Transmission Genetics (Mendelian Theory and its extension, sex linked inheritance, Quantitative traits), Molecular Genetics (Eukaryotic chromatin structure and chromosome organization, cell division, Eukaryotic genomes, Gene mutation), Human Molecular Genetics and Genetic disorder, Population and Evolutionary Genetics
Enzymes and metabolisms	Introduction; Enzymology – Introduction, classification & characteristics of enzymes, enzyme kinetics and inhibition, extraction, purification & application of enzymes; Metabolism & associated diseases – Photosynthesis & carbohydrates metabolism, amino acid biosynthesis & salvage, fatty acids biosynthesis & diseases involved, nucleotide biosynthesis & salvage, bio-geochemical cycles
Microbiology and Immune system	Introduction to microbiology, microscopy, diversity of microbial world, microbial cell organization, microbial nutrition and growth, microbial genetics, infectious diseases and antimicrobial resistance, Epidemiology, evolution and surveillance of infectious pathogens, scope and advances of microbiology, introduction to immunobiology, structure and function of innate and adaptive immune systems, development and maturation of immune cells, the immune system in health and diseases, principles and applications of immunotechnology
Cellular and molecular biology	Cell as basic unit of life, prokaryotic and eukaryotic cells, organelles, compartmentalization, and their function; Cell division. DNA replication, Outline of replication machinery, initiation, maintainance and termination of replication. Transcription, Structure and function of a gene, Outline of transcription machinery Transcriptional initiation, elongation, and termination. Translation, Overview of translation machinery, translation initiation, elongation, and termination. Regulation of Gene Expression, operon, activators, repressors, hormones and signaling factors, epigenetic modification. Post-transcriptional Processing, Transcription attenuation, RNA editing and RNAi. Post-translational Processing, Codon usage and codon bias, Protein folding and molecular chaperons, Protein processing, Protein degradation DNA Damage, DNA Repair, and Origin of Mutation; Cell Signalling and signal transduction, Signalling receptors;

Bioinformatics	Bioinformatics: Overview, history, and significance. Biological Databases: Accessing and querying biological data. Sequence Analysis: Pairwise and multiple sequence alignment, sequence similarity searching. Molecular Evolution: Phylogenetic analysis, evolutionary models. Structural Bioinformatics: Protein structure prediction, molecular modeling. Genomics: Genome assembly, gene prediction, genome annotation. Proteomics: Protein identification, characterization, and quantification. Applications of Bioinformatics in Drug discovery, personalized medicine, systems biology.
Basic Mathematics, statistics and programming For students from non-life science background but interested in pursuing PhD in computational biology / biostatistics	Data, statistics, data collection, presentation of data (grouped and ungrouped frequency table), graphical representation of data (bar graph, histogram, frequency polygon), Population and samples, Frequency distribution, Measures of central tendency (mean, median, mode and their significance), Measures of dispersion (Range, Inter quartile range, Variance, Standard deviation) Distribution of data (normal distribution, binomial distribution, Poisson distribution), Hypothesis testing, concept of p-value. Vectors: Vector algebra, Dot and Cross products and Correlation & Regression: Methods of studying simple correlation: Scatter Diagram, KarlPearson's Co-efficient of Correlation, Spearman's Rank Correlation. Basic C++: I/O functions/operators, Conditional statements: if-else, and switch, Looping and unconditional branching statements, Arrays and matrix operations.

Question Pattern

- 20 MCQs (30% weightage)
- 5 Short answer Qs (60% weightage)
- 1 Passage/comprehension (10% weightage)