SYLLABUS FOR BIOSCIENCES

**BIOCHEMISTRY**
Basic physical chemistry: Properties of gases, chemical equilibrium, pH, ionization of weak acids and bases; solubility and precipitation
Carbohydrates: structure and function (monosaccharides, disaccharides and common polysaccharides – starch and cellulose).
Proteins – primary, secondary, tertiary & quaternary structures; Ramachandran plots
Enzyme: chemical and functional nature of enzymes, Enzyme kinetics
Structure and function of nucleotides, DNA and RNA
Basic metabolic pathways (Glycolysis, TCA cycle, Glyoxalate cycle, Pentose Phosphate pathway).
Biological Membrane: structure and function

**MOLECULAR BIOLOGY**
Prokaryotic and eukaryotic genome organization
Basic mechanisms in replication, transcription and translation
Gene regulation in prokaryotes: lac, ara and trp operons
Mutations: Types of mutations, Isolation of mutants
Enzymes used in molecular cloning and their applications
DNA sequencing: chemical and enzymatic methods
Southern, Northern and western blotting and hybridization
Vectors: types and characteristic features
Directed evolution

**MICROBIOLOGY**
Structure and function of prokaryotic and eukaryotic cell
Microbial Growth – Measurement techniques; growth kinetics
Energy transduction (fermentation, aerobic respiration and anaerobic respiration).
Genetic recombination; basic features of transformation, transduction and conjugation.
Bacteriophages

SYLLABUS FOR BIOCHEMICAL ENGINEERING

Fundamentals of growth: Monod growth kinetics; growth cycle phases for batch cultivation.

Enzyme kinetics: Kinetics of enzyme catalyzed reactions: Michaelis-Menten equation; Lineweaver-Burk plots; Eadie-Hofstee plots; substrate inhibition kinetics; competitive, non-competitive and uncompetitive inhibition; effect of pH and temperature.

Bioreactor kinetics: Batch, fed-batch and continuous (CSTR and PFR) reactors; conditions for “wash-out” and maximum cell production in chemostat cultures.

Analysis of rate data for batch/continuous flow reactors and development of rate equation; Introduction to the concept of yield, titer and productivity;

Principles of recovery operations: filtrations, centrifugation, solvent extraction, chromatography.

Suggested Reading