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