



SEMESTER – V

BRANCH	Subject	Subject Code
B.Sc. (Biotechnology - Major)	Industrial Biotechnology	BTM1-151

Course Objective:-The Main Objective of the course will be to build the basic foundation for studying Biotechnology. The Demand for Trained workforce in Biotechnology is ever growing in Fundamental Research and Industry Sector. Academic and Research Sectors also require Interdisciplinary trained manpower to foster the Biotechnology Revolution. The restructured syllabus combines basic principles of Chemical and Biological sciences in light of advancements in technology. The curriculum aims to impart basic knowledge with emphasis on its applications to make the students ready for industries and research work in concerned field.

Course learning outcomes (CLO):-

1. Understand the basic of cell biology.
2. Appreciate the importance of bonding spatial arrangement of molecules of proper function and stability.
3. Understand both the physical as well as chemical properties of biomolecules.
4. Students can pursue a career in biochemical testing. The decrease of increase in the amount of some of the biomolecules can have clinical significance.
5. Students can also go in for medical laboratory tech courses. Opening opportunities of hospital and pathology laboratories.

Unit – I

Discovery, classifications and nomenclature of enzymes; Physico chemical characterization of enzymes, Enzyme kinetics: Enzyme catalysis in solution kinetics and thermodynamic analysis, effects of organic solvents on enzyme catalysis and structural consequences. Kinetics of enzyme inhibition

Unit – II

Immobilization of enzymes: principle and mechanism: Mechanism of enzyme function and reactions in process techniques; Enzymatic conversions e.g. starch and sugar conversion processes, High Fructose Corn Syrup; Interesterified fat; Hydrolyzed protein etc. and their downstream processing, baking by amylases, deoxygenation and desugaring by glucoses oxidase, beer mashing and chill proofing: cheese making by proteases and various other enzyme catalytic actions in food processing.

Unit – III

Bioprocess technology:

Basic principles in bioprocess technology: Media Formulation; Sterilization: Thermal death kinetics, Batch and continuous sterilization systems, Primary and secondary metabolites, Extracellular enzymes, Biotechnologically important intracellular products, exopolymers,



Unit – IV

Bioreactor designs: Types of fermentation and fermenters, Concepts of basic modes of fermentation Batch, fed batch and continuous; Conventional fermentation vis biotransformation, Solid substrate, surface and submerged fermentation, Fermentation economics, Fermentation media; Fermenter design mechanically agitated, Pneumatic and hydrodynamic fermenters, Large scale animal and plant cell cultivation and air sterilization, Upstream processing Media

Unit – V

Techniques of enzyme isolation, purification and enzyme assay, techniques used for the immobilization of enzymes, Applications of immobilized enzyme in Biotechnology; Bioprocess control and monitoring variables such as temperature, agitation, pressure, pH Microbial processes production, optimization, screening, strain improvement, factors affecting downstream processing and recovery; Representative examples of ethanol, organic acids, antibiotics etc.

List of Experiments (Practical's)

1. Determination of oxygen transfer rate and volumetric oxygen mass transfer coefficient (KLa) under variety of operating conditions in shake flask and bioreactor.
2. Determination of mixing time and fluid flow behavior in bioreactor under variety of operating conditions.
3. Rheology of microbial cultures and biopolymers and determination of various rheological constants.
4. Production of microbial products in bioreactors.
5. Studying the kinetics of enzymatic reaction by microorganisms.
6. Production and purification of various enzymes from microbes.
7. Comparative studies of Ethanol production using different substrates. N
8. Microbial production and downstream processing of an enzyme, eg amylase.
9. Various immobilization techniques of cells/enzymes, use of alginate for cell immobilization