

**MMB301: FERMENTATION TECHNOLOGY****UNIT I**

An introduction to fermentation processes- Range of fermentation process, microbial biomass, Microbial metabolites, Microbial growth kinetics- Batch culture, continuous culture, comparison of batch and continuous culture in industrial applications, fed-batch culture, variable and fixed volume fed batch culture.

**UNIT II**

Isolation, preservation and improvement of industrially important microorganisms, Screening methods, Isolation methods, enrichment liquid culture, enriched culture, Industrial fermentation- typical media, media formulation, water, energy and carbon sources, nitrogen sources, minerals, vitamin sources, nutrient recycle, buffers, precursors and metabolic regulators, oxygen requirement.

**UNIT III**

Media sterilization, sterilization of fermenter, sterilization of the feed. Inocula for industrial fermentation- development of inocula for yeast, bacteria, fungi and actinomycetes, the inoculation of fermenters, the use of spore inoculums, inoculation from a laboratory and plant fermenter .

**UNIT IV**

Downstream processing: Bioseparation - filtration, centrifugation, sedimentation, flocculation; Cell disruption; Liquid-liquid extraction; Purification by chromatographic techniques; Reverse osmosis and ultra filtration; Drying; Crystallization; Storage and packaging; Treatment of effluent and its disposal, anaerobic and aerobic treatment of effluents.

**UNIT V**

Bioreactor: Types of reactor: Batch culture bioreactor, plug flow reactor (PFR), continuous stirred tank reactor (CSTR), Fixed and Fluidized bed, bubble column, air lift fermenter. Design of fermenter, basic functions, construction, aeration and agitation, oxygen requirements of industrial fermentation, Instrumentation and control of process parameters, Scale up and scale down process.

**Text Books / Reference Books:**

1. Principles of Fermentation Technology by Stanbury, P.F., Whitekar A. and Hall. 1995., Pergaman, McNeul and Harvey.
2. Biochemical Reactors by Atkinson B., Pion, Ltd. London.
3. Fermentation Biotechnology: Industrial Perspectives by Chand.
4. Biotechnology- A textbook of Industrial Microbiology by Creuger and Creuger, Sinaeur Associates.
5. Bioprocess Engineering Kinetics, Mass Transport, Reactors, and Gene expressions by Veith, W.F., John Wiley and Sons.
6. Bioprocess Engineering Principles by Doran, Acad. Press, London.
7. Fermentation, Biocatalysis and bioseparation, Encyclopedia of Bioprocess Technology by Chisti, Y., Vol. 5, John Wiley and Sons, N, Y.