

Year & Sem: E3S2	Course Code:CH3201	Course Name: Biochemical Engineering	No. of Credits: 4	L 2	T&PS 2	P 0
<p>UNIT I: Introduction to microbiology: Biophysics and the cell doctrine, the structure of cells, important cell types, from nucleotides to RNA and DNA, amino acids into proteins. Kinetics of enzyme catalyzed reaction: the enzyme substrate complex and enzyme action, simple enzyme kinetics with one and two substrates, other patterns of substrate concentration dependence, modulation and regulation of enzyme activity, other influences on enzyme activity.</p> <p>UNIT II: Immobilized enzyme technology: enzyme immobilization, industrial processes, utilization and regeneration of cofactors. Immobilized enzyme kinetics: effect of external mass transfer resistance, analysis of intraparticle diffusion and reaction. Kinetics of cellular growth in batch and continuous culture, models for cellular growth – unstructured, structured and cybernetic models. Thermal death kinetics of cells and spores</p> <p>UNIT III: Introduction to metabolic pathways, biosynthesis, transport across cell membranes, end products of metabolism, stoichiometry of cell growth and product formation. Design and analysis of biological reactors: batch reactors, fed-batch reactors, enzyme catalyzed reactions in CSTR, CSTR reactors with recycle and cell growth, ideal plug flow reactors, sterilization reactors, sterilization of gases, packed bed reactors using immobilized catalysts. Fermentation technology: medium formulation, design and operation of a typical aseptic, aerobic fermentation process.</p> <p>UNIT IV:Transport phenomena in bioprocess systems: Gas-liquid mass transfer in cellular systems, determination of oxygen transfer rates, overall $k_L a'$ estimates and power requirements for sparged and agitated vessels, scaling of mass transfer equipment, heat transfer.</p> <p>UNIT V:Downstream processing: Strategies to recover and purify products; separation of insoluble products-filtration and centrifugation; cell disruption-mechanical and non-mechanical methods; separation of soluble products: liquid-liquid extractions, membrane separation (dialysis, ultra filtration and reverse osmosis), chromatographic separation-gel permeation chromatography, electrophoresis, final steps in purification – crystallization and drying.</p> <p>References/Text Books:</p> <ol style="list-style-type: none"> 1. Biochemical Engineering Fundamentals, 2nd ed., J.E. Bailey and D.F. Ollis, McGraw-Hill, New York, 1987. 2. Bioprocess Engineering, 2nd ed., M. L. Shuler and F. Kargi, PHI Learning Pvt. Ltd, New Delhi, 2009. 3. Biochemical Engineering, J. M. Lee, Prentice-Hall, New Jersey 1992. 4. Bioprocess Engineering Principles, P. M. Doran, Elsevier, Gurgaon, 2005. <p>Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.</p> <p>Video Lectures (Web Links):</p> <ol style="list-style-type: none"> 1. 						