

Chemical and Biochemical Engineering

Semester VII						
S.No	Course Code	Course Name	L	T	P	C
1	CL405T	Bioprocess Engineering	3	0	0	6
2	CL401S	Scientific Presentation	0	0	3	3
3		Program Elective-II	3	0	0	6
4		Program Elective-III/BTP-I	3	0	0	6
5		HSS Elective-I	3	0	0	6
		Total Credits				27

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1	Title of the course (L-T-P-C)	Bioprocess Engineering (3-0-0-6)
2	Pre-requisite courses(s)	Nil
3	Course content	<p>Introduction to Bioprocess Engineering: Introduction to bioprocess engineering: Traditional and modern bioprocess engineering overview, integrated bioprocess, upstream and downstream operations, process flow sheets; Material balance and energy balance for different systems; thermodynamic efficiency of growth, Enzyme technology - Enzyme kinetics, immobilization, and industrial production.</p> <p>Fermentation Processes: Fermentation processes: Outline, overview & types, design, parameters & construction of fermenter and ancillaries; Application in the biotechnology industry; Kinetic models for microbial growth; Behavior of microbes in different reactors; Requirements for fermentation processes and optimization techniques (Plackett-Burman Design).</p> <p>Separation Technology: Solids removal operations - settling, centrifugation and filtration; Product isolation - adsorption and extraction; Purification techniques - precipitation, ultrafiltration, chromatography and electrophoresis; Product polishing operations - crystallization and drying; Integrated bio-reaction and bio-separation processes: Membrane bioreactors, extractive fermentation.</p> <p>Bioprocess Engineering and Industry: Environmental biotechnology - wastewater engineering, bioremediation; Bioprocess instrumentation; Biological systems for the production of commercial goods and services.</p>
4	Texts/References	<ol style="list-style-type: none"> 1. Michael L. Shuler and Fikret Kargi. Bioprocess Engineering: Basic Concepts. Prentice Hall, third edition, 2002. 2. Michael L. Shuler, Fikret Kargi, Matthew DeLisa. Bioprocess Engineering: Systems, Equipment, and Facilities. Prentice Hall, second edition, 2017. 3. Roger G. Harrison, Paul W. Todd, Scott R. Rudge. Bioseparations Science and Engineering. Oxford University Press, second edition, 2015. 4. Carl-Johan Franzén and Christian Larsson. Bioreactors: Design, Operation and Novel Applications. CRC Press, first edition, 2016.