GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Syllabus

Subject Code : 3154403

Subject Name : Biochemical Engineering

WEF Academic Year :	2021 - 22
Semester :	5
Category of the Course :	Professional Elective

Prerequisite : Basic Concepts of chemistry and unit operations.

Rationale : The primary aim of this course is to familiarize students in the field of chemical engineering with essential elements related to biochemical processes. The curriculum will provide students with a comprehensive understanding of biochemical engineering, encompassing its range, practical uses, and benefits compared to traditional methods. Through the course, students will also gain knowledge about the fundamental principles underlying cell culture. This will involve learning about techniques for sterilization, designing bioreactors, and exploring typical unit processes involved in the later stages of refining biological goods.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content :

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Fundamentals of Biology & Biotechnology, Glimpses of Microbial World – Bacteria, Virus and Cell Organelles, Carbohydrate, Nucleic Acid, Lipids, Proteins,	4	14
2	Biochemistry & Thermodynamics of Enzymes, Enzyme Kinetics : Michealis-Menten Kinetics, Regulation of Enzyme Activity: Inhibition, Effects of Substrate and Inhibition, pH and Temperature on Enzyme Activity,	7	16
3	Immobilized Enzymes, Interphase Mass Transfer and Reaction in Immobilized Enzymes, Effectiveness Factor in Immobilized Enzymes,	4	12
4	Bioenergetics and Glycolysis, TCA Cycle, Electron Transport Chain & Oxidative Phosphorylation, Pentose Phosphate Pathways Glycogenesis & Glycogenolysis, Urea Cycle, Gluconeogenesis and Glyoxalate Cycle,	8	14
5	Microbial Growth: Phases and Models, Effect of Mass Transfer on Microbial & Fungal Growth, Effect of Multiple Substrates and Inhibition on Microbial Growth,	6	14

6	Design of Bioreactors, Design of Chemostats, Stability of Bioreactors,	4	10
7	Introduction to Receptor - Ligand Binding, Effects of Ligand Depletion and Multiple Receptors on Binding Kinetics, Receptors-Mediated Endocytosis, Kinetics of Receptor-Mediated Endocytosis, General Model for Receptor-Mediated Endocytosis, Multiple Interacting Microbial Population: Prey-Predator Models,	9	16
8	Manufacture of Biochemicals, Strategies for Biomolecules Separation	4	6

Reference Book :

1. Biochemical Engineering Fundamentals by by James E. Bailey, David F. Ollis
2. Fermentation and Biochemical Engineering Handbook by byCeleste M. Todaro
3. Videos available in YouTube and NPTEL site.

List of Experiments :

1. Analytical Estimation of Glucose from aqueous solution by DNS method using spectrophotometer.
2. Estimation of Protein by Folin-Lowry method
3. To study the Growth kinetic of any microorganism by using Monod Equation
4. Determination of dissolved oxygen concentration from a sample of water.
5. Determination of BOD5 for a given sample of waste water
6. Determination of iodine value of the given sample of vegetable oil.
7. To perform drying operation on any biomass/biological materials and construct the drying rate plot.
8. Determination of free CO2 in a given sample of tap-water.

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