



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-5 (B.Tech.)

Subject: Biochemical Engineering – BETCH15312

Type of course: Professional Elective courses

Prerequisite: Basic Understanding of Physics, Chemistry, Biology and unit operations

Rationale: It's a multidisciplinary field that combines principles of chemistry, biology, and engineering to design and optimize processes using living cells or their components. This allows for the efficient and sustainable production of a wide range of materials and technologies, addressing global challenges and improving human health and well-being

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	0	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No.	Course content	Hrs.	Weightage
1	Fermentation Processes: Evolution and Outline of Fermentation processes, Range of fermentation processes, Unit operations involved in bioprocess engineering, Fermenter design, various parameters in fermentation process, types of fermentation process	15	30%
2	Raw Materials and Media Design: Various raw materials and its applications, Selection criteria of appropriate medium, types of media-simple, complex, crude and synthetic, design and usage of various commercial media for industrial fermentations.	15	20%



3	Growth and Product Formation Kinetics: Batch Culture, Continuous Culture – Multistage systems, Feedback systems, Fed Batch Culture – Variable volume, fixed volume, Cyclic. Applications.	15	30%
4.	Aeration And Agitation: Introduction, Oxygen requirement in fermentations, Oxygen supply, Determination of KLa values, Fluid rheology, Factors affecting KLa values, Balance between oxygen demand and supply, Scale up and Scale down.	15	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	Fermentation Processes: Make presentations (individually or group) on different types of fermentation processes and present in class and submit ppt on GMIU web portal.	10
2.	Raw Materials and Media Design: Make posters on Raw material and its application, faculty will provide different raw material names to students and students individually or in group will prepare poster and submit in GMIU web portal.	10
3.	Industrial Fermenters: Prepare list of design parameters of industrial fermenters and elaborate on parameters of your choice in details and submit report on GMIU web portal.	10
4.	Simulation of Any biochemical process: Run simulation of any biochemical industrial process using DWSIM software and submit its report in GMIU web portal	10
5.	Water pollution from distillery: Make a short report on water pollution cause by distilleries and how currently industries are tackling it and put your review on it in form of short report. submit essay on GMIU web portal.	10
Total		50

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	30%	10%	0%	0%



Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Identify various chemical engineering aspects used in fermentation technology such as fermenter design and its application
CO2	Apply the knowledge of raw materials and media used for industrial fermentation process
CO3	Understand growth and of culture media and formation kinetics
CO4	Determine requirement of oxygen in fermentation, and other aspects such as fluid rheology, scale up and scale down.

Instructional Method:

The course delivery method will depend upon the requirement of content and needs of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done based on Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] James E. Bailey and David F Ollis- Biochemical Engineering Fundamentals.
- [2] Bioprocess Engineering Principles by Pauline Doran, Publisher: Elsevier Science & Technology Books.
- [3] Introduction to Biochemical Engineering by D. G. Rao, Tata McGraw-Hill Education, 2005.
- [4] Biochemical Engineering and Biotechnology by Ghasem D. Najafpour, Publisher: Elsevier Science & Technology Books

