GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL ENGINEERING (COMPUTER AIDED PROCESS DESIGN) (16)

INDUSTRIAL BIOTECHNOLOGY (IB)

SUBJECT CODE: 2721601

SEMESTER: II

Type of course: Major elective-II (M.E.CAPD)

Prerequisite: Energy & Mass integration(EMI)

Rationale: Able to understand the importance of biotechnology in chemical engineering field.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	0	2#	4	70	30	20	10	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	INTRODUCTION TO INDUSTRIAL BIOPROCESS: Introduction to fermentation process - definition, scope, history, microorganisms and industrial products - Screening for microbes of industrial importance - Isolation and preservation of industrial micro organisms.	10	20
2	STRAIN IMPROVEMENT AND MEDIA PREPARATION: Environmental factors and genetic factors for improvement - Immobilization methods - Types of carriers - advantages and disadvantages - Inoculums media and inoculums preparation - Medium requirements for fermentation process.	11	20
3	FERMENTATION PROCESS: Types of fermentation processes - Solid state, surface and submerged fermentations - batch, fed batch, continuous fermentations – Directdual or multiple fermentations - Scale up of fermentations	11	20
4	PRODUCTION OF PRIMARY AND SECONDARY METABOLITES: Fermentative production of industrial alcohol, beer - Principles of wine making -Fermentative production of citric acid, vitamin B12, glutamic acid - Antibiotics, commercial production of benzyl penicillin and tetracyclines.	11	20
5	PRODUCTION OF MODERN BIOTECHNOLOGICAL PRODUCTS : Production and application of microbial enzymes - Amylases, lipases and proteases - Steroid transformations - Microbial biopesticides and biofertilizers - Principles of vaccine production and types of vaccines	11	20

Reference Books:

1. Casida, J.R., L.E., Industrial Microbiology, Willey Eastern Ltd, New Delhi,1stEdition, 2006

2. Wulf Cruger and Anneliese Cruger., Biotechnoloogy, (A text book of industrial Microbiology), Panima Publishers, New Delhi, 2ndedition, 2003
3. Prescott and Dunn, Industrial Microbiology, CBS Publishers, New Delhi, 4th Edition, 1987
4. Young, M.Y., Comprehensive Biotechnology Vol. 1-4, Pergamon Press, Oxford, 1st Edition, 1985
5. Stanbury, P.F., and Whitaker, A., Principles of Fermentation Technology, 2nd Edition, Pergamon Press, Oxford, 2005.

Course Outcome:

After learning the course the students should be able to:

- Learn about the Fermentation Processes and different types of Fermentor.
- Understand the Isolation and preservation of industrial micro organisms.
- Learn about the Production and application of microbial enzymes.
- Learn about the Medium requirements for fermentation process.
- Understand the Fermentative production of industrial alcohol, beer etc

List of Experiments:

Tutorials/Presentation/Practicals based on above topics

Open Ended Problems:

1. L-Lysine production for Batch Fermentation Bio Chemical Process.
2. Production of Oil & Fatty Acid by Fermentation Process.
3. Classification of various Bio Reactors.
4. Nutritional Requirements in Fermentation Processes

Major Equipment:

Fermentor, Batch Reactor, BOD ,Different types of Sterilizer, Autoclave etc.

List of Open Source Software/learning website:

- www.chem.mtu.edu/~drshonna/cm4120/BioUO.pdf
- www.massey.ac.nz/~ychisti/FermentInd.PDF
- www.sciencemadness.org/talk/files.php?pid=363021&aid=35062.
  microbiology.scu.edu.tw/lee/.../11.%20Fermentation%20Medium(51).pp

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.