



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3721809

Semester – II

Subject Name: ANAEROBIC BIOTECHNOLOGIES

Type of course: Applied Science

Prerequisite: Knowledge of Biological Processes for Wastewater Treatment

Rationale: Anaerobic treatment technologies of waste water offers an attractive treatment options for wastewater treatment along with opportunities for energy recovery

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	Anaerobic Treatment : Fundamental concept & Application : <ul style="list-style-type: none">• Advantages & disadvantages of Anaerobic Treatment.• Principles of Anaerobic Treatment, Methanogenic series• Metabolism, COD equivalence of Methane.• Factors affecting Anaerobic Treatment• Evaluating the applicability of Anaerobic Treatment	6
2	Microbiology and Biochemistry of Anaerobic Treatment processes. <ul style="list-style-type: none">• Sources of Methane in Anaerobic Treatment• Role of Acid fermentation and Methane fermentation• Characteristics	8
3	Anaerobic Reactor Configuration <ul style="list-style-type: none">• Anaerobic Suspended growth processes• Anaerobic Attached growth processes• Anaerobic Sludge Blanket processes	2
4	Conventional and High Rate Reactors Conventional reactors: stabilization pond, Oxidation pond, anaerobic lagoons standard rate and high rate sludge digesters. High rate reactors: Upflow Anaerobic Sludge Blanket , Upflow Anaerobic Filters, Expanded Granule Sludge Blanket, Internal Circulation, migrating blanket, biphasic anaerobic reactors	8

Page 1 of 2



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3721809

5	Process operation parameter <ul style="list-style-type: none">Mixing and facilitiesHeating facilities	2
6	Design of Anaerobic reactors : <ul style="list-style-type: none">Conventional treatment units including stabilization pond, Oxidation pond, anaerobic lagoons, standard rate and high rate sludge digesters.High rate reactors : Upflow Anaerobic Sludge Blanket , Upflow Anaerobic Filters	12
7	Treatability Protocol Assay techniques, Biochemical Methane Potential (BMP), Anaerobic toxicity assay, Treatability Parameters, pilot plant Studies	4

Reference Books:

1. Anaerobic Biotechnology for Industrial Wastewater by Dr. R.E. Speece ARCHAE PRESS
2. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy
3. Design of Anaerobic Process for the Treatment of Industrial and Municipal Wastes by J. F. Malina
4. Biological Process Design for Wastewater Treatment by Larry D Benefield, Clifford W Randall

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the pathways of anaerobic treatment.	20%
CO-2	Design different types of anaerobic bioreactors depending upon the suitability of each for different types of waste	30%
CO-3	Optimize the performance of anaerobic reactors	20%
CO-4	Understand the effect of heating and mixing on treatment efficiency.	10%
CO-5	Understand the treatability protocol.	20%

List of Tutorials/ Experiments:

Term work will comprise of questions, numericals and design of conventional and high rate anaerobic reactors.

Major Equipment: -----

List of Open Source Software/learning website:

1. <https://nptel.ac.in/>