GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL MANAGEMENT (18)
ANAEROBIC BIOTECHNOLOGIES
SUBJECT CODE: 2741801
M.E. 4TH SEMESTER

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

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Anaerobic Treatment : Fundamental concept, Application • Applications, 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	7	18
2	Microbiology and Biochemistry of Anaerobic Treatment processes. • Sources of Methane in Anaerobic Treatment • Role of Acid fermentation and Methane fermentation • Characteristics	6	14
3	Anaerobic Reactor Configuration • Anaerobic Suspended growth processes • Anaerobic Attached growth processes • Anaerobic Sludge Blanket processes	6	14
4	Treatment of raw sewage under Tropical condition	1	2
5	Process operation parameter • Mixing and facilities • Heating facilities	6	14
6	Design of Anaerobic reactors : Detailed design of any four reactors from following:- • Conventional treatment units including stabilization pond, Oxidation pond, anaerobic lagoons standard rate and high rate sludge digesters.	8	19

	• High rate : Upflow Anaerobic Sludge Blanket , Upflow Anaerobic Filters, Expanded Granule Sludge Blanket, Internal Circulation, migrating blanket, biphasic anaerobic reactors		
7	Treatability Protocol • Assay techniques, Biochemical Methane Potential (BMP), Anaerobic toxicity assay, Treatability Parameters, pilot plant Studies	8	19

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 Outcome:
After learning the course the students should be able:

1. Understand the pathways of anaerobic treatment.
2. Optimize the performance of anaerobic reactors.
3. Design different types of anaerobic bioreactors depending upon the suitability of each for different types of waste.
4. Understand the effect of heating and mixing on treatment efficiency.
5. Understand the treatability protocol.

List of Tutorials:
Term work will comprise of questions, numericals and design of high rate anaerobic reactors.

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.