GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL MANAGEMENT (18)

ADVANCED WASTEWATER TREATMENT TECHNOLOGIES

SUBJECT CODE: 2731801

M.E. SEM-III

Type of course: Applied Science

Prerequisite: Basic knowledge of wastewater treatment

Rationale: The knowledge of advances taking place in the field of wastewater treatment will be provided in this subject.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks		Practical Marks				
L	T	P	C	ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Advanced Biological Treatment systems: Membrane Bio-reactors: Fundamentals, Design, Glossary of terms Moving Bed Biological Reactor, Static Aerobic Fixed Film reactor ,Fluidized Aerobic Bed reactor	12	29
2	Membrane Separation, Categories of membrane operations, Membrane Applications, Mass transport and permeate flux and fouling in pressure driven processes. Principles of rejections, Membrane biofouling, Types of membrane processes: Reverse Osmosis; Nanofiltration; Ultrafiltration; Electrodialysis; Ultra filtration and its applicability, limitations, advantages and disadvantages; Field evaluation and piloting; Coagulation and membrane separation.	08	19
3	Ion Exchange: Fundamentals of Ion Exchange Types of Ion exchange resins General characterization of ion exchange resins Theory and application of Ion exchange	08	19
4	Advanced Oxidation Process: Application of Fenton's Reagents Wet air oxidation Thermal oxidation	06	14
5	Sludge Dewatering systems Cake Filtration Equipment Batch or Semi batch equipments : ,Plate and frame filter press, Pressure leaf filter, Nutsche filter/dryer ,Horizontal Plate filter/dryer. Continuous Equipments: Rotary Drum filter, Centrifugal filter, Horizontal belt filter, Disc filter	08	19

Reference Books:

(1) Membrane Systems for wastewater Treatment by Water Environment Federation.
(2) Practical Wastewater Treatment by David L Russell published by John Wiley & Co.
(3) Wastewater Engineering Treatment and Reuse by Metcalf & Eddy

Course Outcome:

After learning the course the students should be able to:

1. Apply advanced technologies in Wastewater treatment.
2. Select the most appropriates types of membrane processes for tertiary treatment of wastewater.
3. Apply advanced oxidation processes to treat concentrated non biodegradable wastewater.
4. Apply tertiary treatment processes like adsorption, ion exchange for optimum removal of pollutants

List of Experiments :

(1) Assignments on the questions related to Advanced Biological Treatment systems, Membrane Separation, Ion Exchange, Hybrid Membrane Systems, Advanced oxidation process.

(2) Sketches and description of Sludge Dewatering systems

Design based Problems (DP)/Open Ended Problem:

Treatability studies using advanced treatment technologies like Advanced oxidation processes, membrane processes

List of Open Source Software/learning website:

www.nptel

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.