GUJARAT TECHNOLOGICAL UNIVERSITY

BACHELOR OF ENGINEERING SYLLABUS

Subject Code : N117AB01

Subject Name : Design and Operation of Industrial Wastewater Treatment Process

WEF Academic Year :	2026-27
Semester :	7
Category of the Course :	Minor Degree Course

Prerequisite : A good understanding is required regarding the environmental science. Mathematical knowledge is also required.

Rationale : The main objective of this subject is to design and understand the operation of industrial wastewater treatment process. This subject provides knowledge regarding the different processes involved in the treatment of industrial waste water as well as the design aspects.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	0	30	0	100

Course Content :

Sr. No.	Course Content	No. of Hours	% of Weightage
1	**Design Principles of Physico-Chemical Treatment Units:** Coagulation and flocculation, design of clari-flocculator, Sedimentation; concept and design of high rate sedimentation techniques. Filtration- Design of filter media for slow and rapid sand filter, Design of sewage treatment plant units-screen chamber, Grit chamber, Trickling filters.	**12**	**27**
2	**Design Principles of Biological Treatment Aerobic and Anaerobic Process:** Kinetics of biological growth; Design of activated sludge process and its modifications. Anaerobic treatment-High rate anaerobic treatment processes; sludge stabilization and design of anaerobic digesters, Activated sludge process.	**10**	**21**
3	**Industrial Wastewater Treatment Processes:** Introduction-magnitude of industrial pollution, their characteristics and impacts; selection procedure for physical, chemical and biological methods of industrial wastewater treatment.	**12**	**27**

4	**Practical Applications in Industries:** Important aspects of Treatment Plant Operation, Trouble shooting, planning, Case studies-Manufacturing process description; pollution sources, waste reduction and treatment methods for industries, Small scale industries and pollution issues, concept of CETPs, concept of zero discharge.	**11**	**25**

Reference Book :

1. Design of Municipal Wastewater Treatment Plants: WEF Manual of Practice No. 8 ASCE Manuals and Reports on Engineering Practice No. 76, 5th Edition, 2010.
2. E. D. Schroeder, Water and Waste Water Treatment, McGraw Hill., 1979.
3. S. J. Arceivala, Waste Water Treatment and Disposal, Marcel Dekker Inc., 1981.
4. G. Tchobanoglous, Frank Burton QC, Waste water Engineering: Treatment, Disposal and Reuse, Metcalf and Eddy Inc., McGraw-Hill, 1991.
5. G. L. Karia & R. A. Christian, Waste Water Treatment, PHI Publication.

Course Outcome :

After Completion of the Course, Student will able to:

Sr. No.	Course Outcomes	Marks %Weightage
01	To be able to design various components of Physico-Chemical treatment units.	21
02	To be able to utilize various principles for design of biological treatment aerobic and anaerobic process.	27
03	To select appropriate methods for industrial wastewater treatment processes through study of magnitude, characteristics and impacts of waste water.	27
04	To analyze practical application in industries through case studies of various industries including CETPs and correlate them with ETP operation.	25

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

List of Experiments: (Minimum 6 experiments need to be performed)

1. Overall design of sewage treatment plant units.
2. To design treatment unit like clari-flocculator.
3. To design treatment unit like filtration systems.
4. To design treatment unit like conventional activated sludge process.
5. To design different treatment aeration devices.
6. To design treatment unit like trickling filter.
7. To determine chloride content of waste water sample.
8. To determine nitrogen and phosphorus of waste water.

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